



CHEETAL

JOURNAL OF

The Wildlife Preservation Society of India

Vol. 42

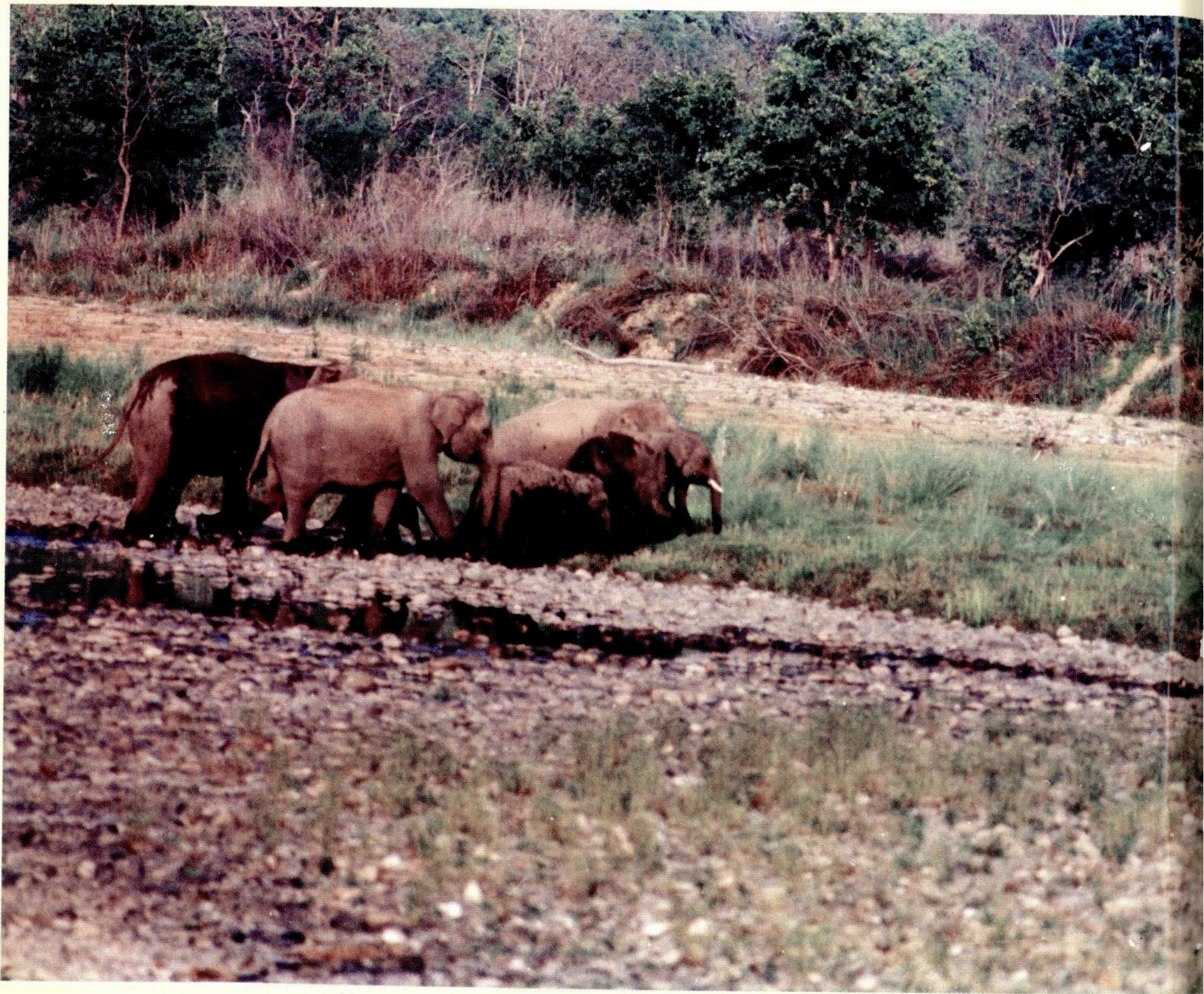
Dehradun, 2004 (April 03 to Oct.03)

Nos. 1&2



Sambar (Cervus eldi eldi McClelland) The Manipur Brow antlered deer

Photo by : Salam Rajesh



Innocent Elephants

Photo by : Narendra Singl

Benign gesture of a British ruler

Towards the close of nineteenth century occasional *kheda* operations were undertaken by the erstwhile Maharaja of Balrampur for the capture of wild elephants in the bhabar belt of Garhwal district, which now comprises Lansdowne and Kalagarh forest divisions. These operations left only a few big males in the wild in that area. It may be reckoned that Maharaja of Balrampur and Nawab of Rampur had respectively ninety and fifty elephants in their stables. As a result of frequent *kheda* operations, not more than a hundred elephants were left in these forests between Tanakpur on the Sharda river and Hardwar on the Ganga.

Even in those days, when elephant fodder was plenty in the forests inhabited by elephants, they occasionally raided sugarcane and paddy fields surrounding the forests. The damage that a single elephant can do to cultivation in one night is astounding.

In 1912 a proposal was submitted to the Government of United Provinces that *kheda* operations should be undertaken in Garhwal district. Sir John Hewett, the then Lt. Governor of the erstwhile United Provinces of Agra and Oudh, quietly turned down the proposal with a note which reads as under :-

The small number of elephants that still survive in U.P. forests, under conditions where they were not likely to be able to do harm as they do in Uganda, may well be left to live their own lives in quietness, subject to stern measures being taken against any transgressors, who take human life. What is to be the future of these grand animals, who are now much less needful for the service of man than they used to be, while the advance of cultivation into their wild haunts renders their limitation necessary to prevent the work of the pioneers of civilization from being of no effect ?

I. S. Negi

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APOLOGY

We sincerely apologize for the inordinate delay in the publication of "Cheetal" Vol.42 Nos.1&2. The delay took place due to some unavoidable circumstances, which is regretted.

I.S. Negi
Hony. Secretary

Obituary

With profound grief we are informing our members and readers that Sri N.D. Bachkheti, president of Wildlife Preservation Society of India has passed away on 15-3-2003. Sri Bachkheti joined U.P. Forest Service in 1948 and by dint of his hard and sincere work rose to the highest executive post of Inspector General of Forests and Special Secretary to the Govt. of India. Sri Bachkheti was an intellectual in the true sense and left many indelible marks in the field of forestry and wildlife in India in general and in Uttarpradesh in particular. Not only in forestry but he was champion in the field of wildlife preservation where he rendered invaluable service to the preservation of wildlife. He had the credit to create and establish the National Zoological Park, Delhi, a zoo at Kanpur, another at Tatanagar (Jamshedpur) and was advisor to zoos at Chhatbir in Punajb and the High Altitude zoo at Nainital.

As a person Sri Bachkheti was an affectionate man and was admired by his superiors and respected by his juniors.

Sri Bachkheti was associated with the Wildlife Preservation Society of India right from its inception and was its executive Vice President for a number of years. He became President of the Society after the death of late His Highness Maharaja of Nabhay which post he held till he breathed his last on 15-3-03. His demise has created a void in the society of wildlife lovers, which will be difficult to fill in near future.

On behalf of the Wildlife Preservation Society of India and readers of "Cheetal" and on my personal behalf, I convey our sincere condolence to the grieved family and pray to the Almighty to grant eternal peace to the departed soul and courage to the grieved family in this hour of mourning.

I.S.NEGI

जंगलों के घुमक्कड़ गाथाकार रामेश बेदी नहीं रहे

वन्य-जीव विशेषज्ञ, कुशल फोटोग्राफर और वनस्पति जगत के महान् शोधकर्ता श्री रामेश बेदी का 9 एप्रिल को नई दिल्ली स्थित बत्रा अस्पताल में निधन हो गया। वे जीवन के अठासी वसन्त पूरे कर चुके थे।

20 जून, 1915 को कालाबाग (अब पाकिस्तान) में जन्मे रामेश बेदी की शिक्षा-दीक्षा गुरुकुल विश्वविद्यालय में शुरू हुई। प्रकृति की सुरम्य गोद में विद्यार्थी जीवन संवरना शुरू हुआ। बाल मन पर गुरुकुल के संस्कारों की जो अमिट छाप पड़ी वह जीवन-पर्यन्त बनी रही। गुरुकुल में रहकर उन्होंने उच्च शिक्षा प्राप्त की। विद्यार्थी जीवन से ही उनका प्रकृति और जानवरों के प्रति रुझान बढ़ता चला गया।

1935 से पत्र-पत्रिकाओं में लिखना शुरू किया। जीवन के अन्तिम पड़ाव तक पहुंचते-पहुंचते उन्होंने वन्य-जीवों और वनस्पतियों पर लगभग सौ पुस्तकों का प्रणयन किया। अभी लगभग बीस पुस्तकों पर कार्य कर रहे थे। अशक्त शरीर, लेकिन प्रबल इच्छा शक्ति से सम्पन्न सरस्वती के वरद पुत्र श्री बेदी की साहित्य साधना अस्पताल में भी मृत्यु से कुछ घण्टों पूर्व तक निर्बाध रूप से चलती रही।

आयुर्वेद के सुविख्यात विद्वान् श्री बेदी ने जड़ी-बूटियों की खोज में हिमालय की दुर्गम घाटियों और हिमालय पार लद्दाख के उजाड़ पर्वतीय मरुस्थल में दुष्कर यात्राएं कीं। अभेद्य जंगलों, दुरुह पर्वतों, घाटियों और भूटान, ब्राजील के विस्तृत दौरों में श्री बेदी ने जड़ी-बूटियों के दस हजार से अधिक नमूनों का संग्रह किया जो राष्ट्रीय तथा अन्तर्राष्ट्रीय महत्त्व के हर्बेरियमों में सुरक्षित है। भावी वैज्ञानिक तथा शोधकर्ता इनसे लाभ उठाते रहेंगे।

जीव-जन्तुओं और वनस्पति के अध्ययन को सुगम बनाने के लिए उन्होंने कुशल फोटोग्राफी का आदर्श प्रस्तुत किया। कैमरे के जादूगर डॉ. बेदी ने जीव-जन्तु और वनस्पति विषयक चित्रों का विशाल संग्रह विरासत में छोड़ा है। चित्रों के कारण उनका साहित्य सजीव हो उठा है।

देश के प्रमुख पत्र-पत्रिकाओं में उनके लेखों की लेखमालाएं छपीं। दर्जनों विदेशी पत्रिकाओं में भी वन्य-जीवों के सम्बन्ध में उनके लेख छपते रहे हैं।

श्री बेदी ने तमाम उम्र जंगल को जानने में गुज़ार दी। वनस्पतियों और वन्य-जीवों से सम्बन्धित महत्त्वपूर्ण जानकारीयों और अपने रोचक अनुभवों को उन्होंने लाखों लोगों तक पहुंचाया। वे जंगल के पर्याय बन चुके थे। हिन्दी साहित्य को वन्य-जीवों और वनस्पतियों से समृद्ध करने में उनका प्रशंसनीय योगदान रहा।

नई पीढ़ी के लिए वे वन्य-प्राणियों के संरक्षण, उनके प्रति संवेदना का भाव जागृत करने के लिए प्रेरणास्रोत रहेंगे। भारत के नेशनल पार्कों और अभयवनों में वन्य-जीवों का प्रत्यक्ष ज्ञान प्राप्त कर उसे पाठकों तक बहुत ही सरल और रोचक शैली में सम्प्रेषित किया। उनके द्वारा लिखी

जीव-जन्तुओं की पुस्तकों को पढ़ने में उपन्यास जैसा आनन्द मिलता है। वे कहा करते थे, 'सभी वन्य-जीवों की मैं कद्र करता हूँ, उनका संरक्षण करता हूँ। भले ही वे हिंसक हों, पिशाच हों, खंजर सरीखे दांतों से लैस हों, पैने नाखूनों से युक्त हों, वज्र के समान प्रहार करने वाले हों, घात लगाकर वार करने वाले हों, अथवा उपायों से शिकार करने वाले हों।'

जंगल का आदमी बनने के लिए उन्हें किसी ने गाइड नहीं किया। उन्हीं के शब्दों में, 'बस मैं सब कुछ अपने आप सीखता गया। जंगल में डर नहीं लगता था। उसका नाम सुनते ही मेरी आंखों के सामने जंगल के कितने ही लुभावने दृश्य आ जाते थे। इसलिए मुझे जब भी मौका मिलता, मैं जंगलों में घूमने निकल जाता। उत्सुकता और रोमांच का संचार हो जाता था।'

कुछ दिन वर्धा में राष्ट्रपिता गांधी के साथ रहे और उनके वानस्पतिक अनुभव को अपनी पुस्तकों में शामिल किया।

जिज्ञासु प्रकृति के धनी श्री बेदी को उनके महान् योगदान के लिए दर्जन भर पुरस्कारों से सम्मानित किया गया। 'कर्म ही पूजा है' के वे साक्षात् उदाहरण थे। **कड़ा अनुशासन, सादा जीवन और उच्च विचार** का उन्होंने जीवन-भर स्वभावतः पालन किया।

बेदी शोध संस्थान, डी 28 राजौरी गार्डन
नई दिल्ली 110027, फोन 25440950

OBITUARY

ALLAN FRANCIS OSWALD

(1927-2003)

Shri Allan Oswald, an ex-forest officer of the Indian Forest Service (IFS) passed away peacefully on 28 January 2003, in Melbourne, Australia. He maintained his high sense of integrity, dignity and duty right to the end.

Allan was born in Rewa and attended schools in Jabalpur (St Joseph's Convent); Mussoorie (Hampton Court); Nanital (St Joseph's College) and Bombay (as it was then) (St Mary's). His fondest memories of his school years were the days he spent in Nanital. After completing his Senior Cambridge he undertook a course in commercial studies and Intermediate Science (St Xavier's College). In 1946 he attended the Allahabad Agriculture College and after graduating from that College he attended the Indian Forest College (IFC) in Dehra Dun. He graduated from the IFC in 1953.

Allan served the forests and the people of India from 1953 until he migrated with his family to Australia in 1972. While in the IFS he served in various locations including Madhya Pradesh and Uttar Pradesh. He remembered his service in the district of Sidhi and as a lecturer at the Forest Research Institute most fondly. He was especially proud of his opportunities to assist in conserving the flora and fauna of India and the privilege of teaching and working with some of the brightest, talented and committed people in India. He was also proud of his association with the 'Cheetal' magazine, a 'Journal of the Wildlife Preservation Society of India'. He was editor of that magazine in the early 1970's and contributed a number of articles to it. In his article, 'The White Tigers of Rewa' in 'Cheetal' Vol.2, No.2 (April 1960) at p.63 he argues that 'the results of the experiment [to breed white tigers] at Rewa... appears to indicate that the white colouring, or lack of orange-red pigmentation, is hereditary.' He suggested that the reason for the color change from orange-red to white is based on the gene of the white tiger being a mutated recessive gene to the dominant orange-red color gene is the 'normal' tiger.

Having migrated to Australia for family reasons, Allan became a school teacher at a secondary school in Sunbury, Melbourne and remained there until he retired. He taught agriculture science, biology, geography and economics to senior students. During his years in Australia he continued to promote interest in, and impart knowledge of, the preservation and conservation of all forms of flora and fauna.

Shri Allan remained a son of India until his death and never stopped loving the flora and fauna of his beloved India. One would like to think he has now with other IFS officers and foresters who have made the journey to the next world. I can see him sitting under the boughs of a deodhar listening to the calls of the jungle. May his soul rest in peace.

'Well done thou good and faithful servant,

Enter thou into the Joy of the Lord'

Black bear the Villain of hills

By

I. S. Negi IFS (Retd.)

BLACK BEAR is perhaps the most ferocious wild animal. It attacks human beings suddenly and unprovoked. When charging a man it stands erect upon its hind feet, howls loudly, makes menacing gestures and mauls him badly.

There are two varieties of bear commonly found in India. One is Himalayan black bear (*Ursus torquatus*) and the other sloth bear (*Melursus Ursinus*). Besides these there is the brown bear (*Ursus Isabellinus*), which is found throughout the Himalayan range, near the snow line. All bears have pointed faces and are dog like in appearance. They are short sighted animals but have acute sense of scent. Both anatomically and physiologically they are more akin to dog than to cat family.

The brown bear is found in abundance in Western Himalayas and has been known to kill cattle and sheep and feed on their flesh, though as a rule his diet is restricted to grass, roots, insects and grubs. In winter, when driven lower down by heavy snowfall, they raid agricultural crops and vegetables. During winter months these bears retreat to caves and hollow tree trunks to hibernate and only come out as the spring sets in, ie; about March/April. They are timid animals and normally run away on the sight of a man.

The Himalayan black bear, (*Ursus torquatus*) inhabits the Himalayan mountains, from which it derives its name and is very often met with on the same

ground as the brown bear, but they do not reach the snow line and live at elevation between 4000 and 10000 feet. They prefer dense oak forests but also live in fringing forests bordering agriculture and having shady ravines.

Himalayan black bear has been seen on the Shiwaliks south of Doon Valley. The Himalayan black bears are both herbivorous as well as carnivorous and more often than not eat crops like maize, ragi, wheat and vegetables. But they will readily kill and eat a small animal they may come across. They also eat carcasses of dead animals and kills of panther.

Himalayan black bear is a ferocious animal. It attacks a person when suddenly encountered. In olden days when forests were dense and bears abounded, incidence of bear attacking men/women were fairly common. There could be seen hundreds of mutilated faces amongst the hill people, some presenting a ghastly sight with nose and lips torn away. That bore the testimony as to how savage the Himalayan black bear could be. The bears lie up for the day in thickly wooded ravines or slopes of hill sides where men and women going to cut grass or collect wood sometimes fall victims of them. They attack the human beings on the face and are capable of inflicting severe wounds with their long and sharp claws. They have a peculiar aversion for man's nose, which he badly mutilates. Bears are more dreaded and awed by hill

men than even tiger and panther. There is a gossip going around the villages that whenever a bear attacks, one should run downhill. The long tufts of hairs on the head of bear cover the eyes and impair its vision. The bear loses track of its victim and man thus escapes the attack.

There is yet another myth about the black bear. When a black bear is wounded by the bullet of a shikari and the wound bleeds profusely, the bear plugs the wound with a pallet of leaves or grass in order to stop bleeding. So conscious is the black bear of the fact that excessive loss of blood will take his life!

Himalayan black bear prefers to live in oak forests, where oak acorns and other wild fruits are available in plenty for most of the year. They make regular nest on the top of oak trees by bending branches and lie up in these, basking in spring sun. They occupy these nests for a fortnight or so and move to other areas in search of acorns (oak fruits). Black bears are excellent climbers and climb the trees for honey of which they are extremely fond of. Though the main diet of the bear is wild fruits, agricultural crops but they are fond of berries. In hills, especially in the month of April, bears are often seen, sometimes the whole family, standing on their hind feet eating rubus berries with much fanfare.

The Himalayan bears, both black and brown have splendid coats of fur. The fur of black bear is rather coarse; whereas that of brown bear is softer. In the past the hill people used the skin of black bear for

moulding their wooden or ringal (hill bamboo) suitcases or other containers. Bears in the hills were considered a nuisance and agricultural pest and were killed indiscriminately in the past. Before the independence local governments granted awards for killing bears. Black bears were also killed for bile which is considered a strong aphrodisiac and used in many country medicines. The fat of black bear is valued for medicinal properties and was extensively used for cure of rheumatism.

Sloth bear : The sloth bear is found throughout India, from the foot hills of Himalayas to the extreme south of the Peninsula, in places suitable to him. He prefers low, rocky and wooded hills and generally lives in caves from where it is not difficult to drive him out by the aid of crackers and stones. It feeds on ber (zizyphus jujuba) fruits, but the fruits of pipal, gular and mahuwa are favourite with the sloth bear and it some times travels long distances at night to find these trees that happen to be in fruits. They climb on to the top of most branches and shake down as much fruits as he can and then feasts on the fallen fruits on the ground.

The sloth bear is purely vegetarian and insectivorous in his diet and has not been known to eat flesh. Unlike its cousin the Himalayan black bear. During the greater part of the year wild fruits and berries are available in abundance. For rest of the year when fruits are not available, the sloth bear lays hands on white ants. The animal is an expert in discovering and digging up the nests of termites, sucking

them out with long drawn breaths that can be heard a fair distance away in the quiet stillness of the night. However fond the bear may be of fruits the real sweet dish in his menu is honey.

The sloth bear has only two cubs at a time and these are usually born in caves and are blind for three to four weeks after birth. When they are able to walk a little bit the mother takes them along with her on outings, safely perched on her back clinging to her long hairs. A she bear with cubs is a dangerous beast for an unarmed man to meet as she will charge without hesitation and savage a man dreadfully. In old days it was not uncommon to find a few cases of men having been mounded badly by these bears and most of these cases occurred when people passed through the jungle very early in the morning or late in the evening. Before the wild life (protection) Act 1972 came into force black bear was the animal that was so often seen in Northern India being led about with a string

through his nose and his canine teeth extracted and made to perform dance and tricks before admiring crowds. The poor beast had often bad days when he once became the property of man for he was led along hot dusty roads in the terrible heat of summer from village to village, regardless of the fact that he was often frothing at the mouth for want of water and perhaps hungry too. Thanks to the wildlife (protection) Act 1972 such cases have now become rare and few and far between. The Madaries catch these bears young and tame them to dance at their tune. Though catching of bear cubs and separating them from their mother is often fraught with danger, but the risk is gladly accepted by men who consider dancing bear a lucrative acquisition. The Himalayan black bear, brown bear and sloth bear have been declared rare and endangered species and are totally protected. They are included in schedule I of Wild Life (Protection) Act 1972.

Migration of Ganges River Dolphin in the Koshi River and its Tributaries

By Dr. Tej Kumar Shrestha*

Abstract

A combination of underwater and surface observations were used to characterize the migration of Ganges river dolphin in the Koshi river of Nepal. This river supports small number of dolphin population that migrate upstream at the height of flood during monsoon (June-September) crossing the obstacle of Koshi barrage. The dolphin follow strictly prespawning migration of the fish during June and July and return back to lower reaches of Ganges river with down river migration of post-spawned migration of fish. Areas and habitat in the river and tributaries used by dolphin throughout monsoon did not change, until flood is withdrawn in November. Relocation to main cradle of the Koshi river occurred during early winter December to February. At this time current velocity of the river decreased with the increase of transparency. Movements of dolphins and their fish catching activity were observed throughout winter in selected calm water pools with underwater video camera due to prevailing high transparency of water.

Introduction

Although there existed scattered information and scientific work on river dolphin (Kasuya and Haque 1972, Shrestha 1986 Shrestha 2001, 2002) but a closer study of dolphin migration was considered essential for its conservation and management. Therefore, opportunity was taken to describe migration of dolphin in the Koshi river.

The Study Area

Koshi river, an interesting river in Nepal is 730 km long which originates from the mountains of Nepal and Tibet. It drains an area of 86,900 sq. km between longitude 85° 20' and 88° 00'. The Koshi river carries largest sediment load amounting to 7,308 tons per square mile of its catchment, most of which is deposited on the flood plains.

The average discharge of the river varies from 1,75,000 cusec to 9,25,000 cusec. The annual sediment load is well over 283×10^6 m³. Maximum rainfall in the Koshi region is about 624.5 mm. No other river in Nepal has so large a catchment as the Sapta (Seven) Koshi river. This river is formed by the confluence of the Sunkoshi, Arun and Tamur rivers at Tribeni near Mahabharat mountain range.

The derivation of the name Koshi is manifold. Historically the river is mentioned in ancient Hindu Puranas and its tributaries are linked to various aspects of the goddess Gauri (Parvati), the word Koshi itself is a symbol of a mythical creature, half fish and half woman (mermaid) whose image has been found in Mahasthan Garha (the capital of old Pandu Vardhan) - the word Koshi can also simply

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mean a holy river. The occurrence of Gangetic dolphin (Susu) in the Koshi river also symbolizes the mermaid story of the ancient past. Koshi Tappu (islets) Wildlife Reserve was established on the bank of Koshi river in 1976. It is located in Sunsari district of Koshi Zone of eastern Nepal. The reserve is rectangular in shape, approximately 24 km long and 10 km wide with a total area of 175 sq km. The Reserve boundaries are delineated by the eastern and western earthen embankments constructed in the early nineteen seventies under the Koshi Project to control the annual floods. The Koshi river flows through a gorge at Chatara, it enters Saharsa district of Bihar (India) from Hanuman nagar, carrying high level of sediment during rainy season. The devastating flood water of the Koshi river brings high silt load which is estimated to the magnitude of 80,000 to 1,20,000 in Nepal. Average rainfall near Chatra is 2211.9 mms. The lowest rainfall recorded is 1468.3 and highest 2887.6 mms. Bulk of rainfall received in 4 months from June to September i.e., an intensity of 100 m/hr for a duration of 15 minutes is quite frequent. The Koshi river has profuse branching into many interlacing channels due to its oscillating character from aeons of time. the virulent character of Koshi river is comparable to Hawong Ho river of China.

Method

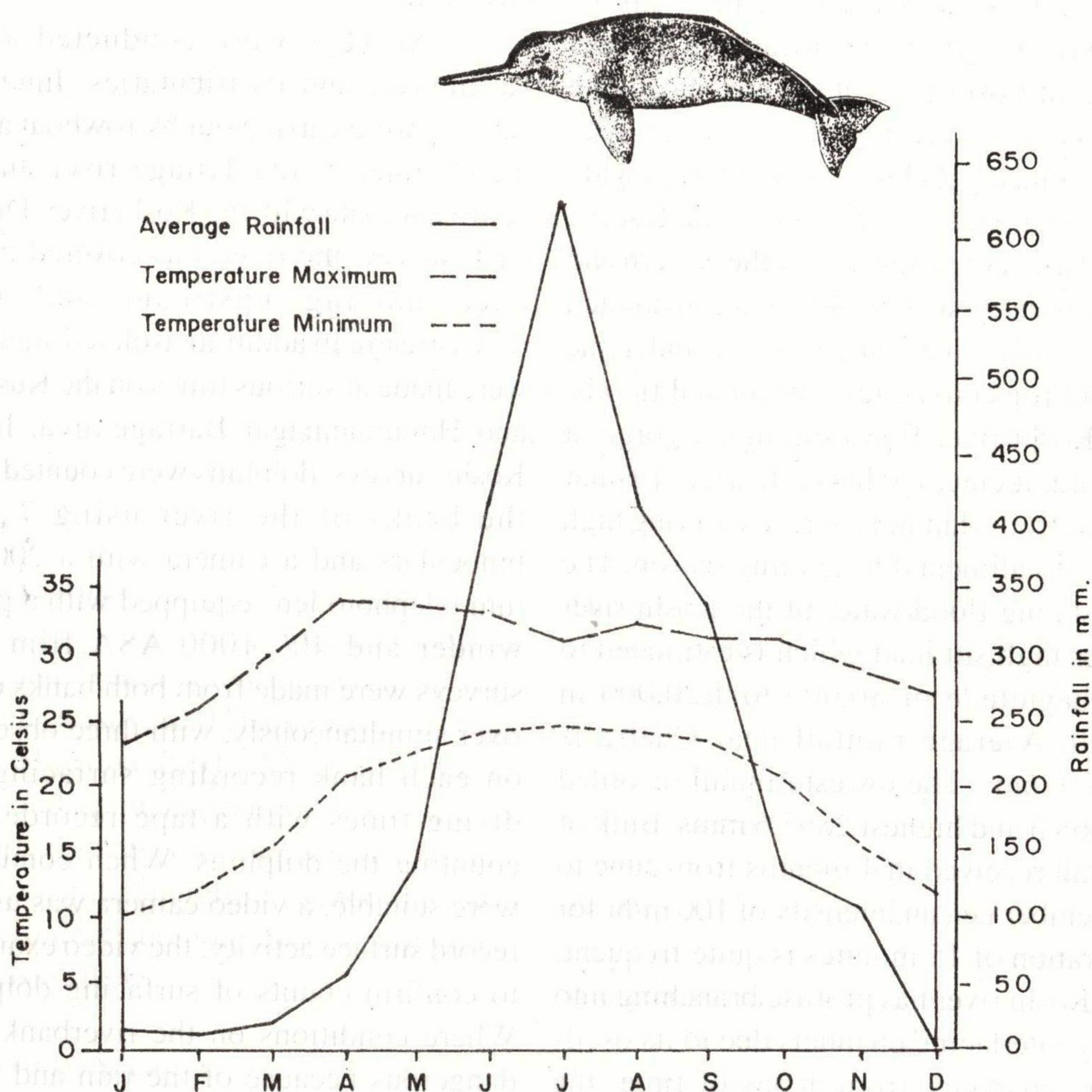
A transect or sample area was established to monitor movement of dolphin and population changes. It is a simple procedure to establish number of transect of straight lines across the river

channel perpendicular to flow. Such transects were established near river confluence and ferry boat sites which became reference point for future observation.

Surveys were conducted along Koshi river and its tributaries. Intensive surveys were carried out by rowboat along the channel of the Trijuga river and its confluence site with the Koshi river. During each survey, the river was covered twice, once moving upstream and once downstream. In addition, isolated sightings were made at various times on the Kushaha and Hanumannagar Barrage area. In the Koshi surveys, dolphins were counted from the banks of the river using 7 x 35 binoculars and a camera with a 200-500 mm telephoto lens equipped with a power winder and 400-1000 ASA film. The surveys were made from both banks of the river simultaneously, with three observers on each bank recording surfacing and diving times with a tape recorder and counting the dolphins. When conditions were suitable, a video camera was used to record surface activity; the video examined to confirm counts of surfacing dolphins. Where conditions on the riverbank were dangerous because of the rain and flood, observations were made from an elevated cliff. Polaroid sunglasses were used to combat the intense glare on the river at mid-day. Nine survey points were used; all were covered in a single day, during daylight hours. Between 30 and 60 minutes were spent at each survey point. The dolphins were counted only after considerable time had been spent observing size, shape,

colour and natural marks of the individual animal, to avoid counting twice the same individual. A theodolite was used to measure width of the river, dimensions of

pools, etc. Detailed environmental and hydrological data were collected during the surveys and are reported in Shrestha (2000) and summarized here.



Average monthly rain fall Maximum and Minimum temperature of Koshi River

During the surveys and collection of reports, people living near the river and local wildlife officials were interviewed and asked for information about sightings of dolphins. They were shown photographs of the Susu to avoid confusion with various large fishes that inhabit the river. The

reports by these casual observers must be treated with some caution. Besides those dead and semiputrefying dolphins stranded during the flood were dissected and their gut were opened to study feeding habits and biological parameters.

Table 1

Biological Parameters of Ganges River Dolphin

1. Head proportionally small with long prominent snout
 2. Tip of beak is slightly thickened
 3. Mouthline curved upward
 4. Beak long lined with 27-32 sharp pointed teeth
 5. Paddle spatulate
 6. Hump degenerate
 7. Fluke broad wide
 8. Cervical vertebrae 5
 9. Sexual maturity reach at length of 170 to 200 cm
 10. Male grow 2 to 2.1 m
 11. Female grow 2.5m largest female weigh 80 kg
 12. Daily food consumption 1,000 to 1,400 kg
 13. At birth young measure 70 to 75 cm.
 14. Upriver migration are triggered by monsoon rain and abrupt rise of water level in June - July. They leave for principal river searching clear water tributaries. High turbidity, high current and rolling down of boulders and logs compel dolphin to migrate from main river to feeder stream.
 15. Down river migration of Susu to original river channel is triggered by receding water in feeder steams, down river migration of post spawned fish.
 16. Susu enjoy communal fishing with cormorant, fishing eagle, otters, white heron, stork and other water birds.
 17. Live associating with (biocoenotically) turtles *Chitra indica*, *Hardella thurgi* and *Aspidoetes punctatus*.
 18. Swimming pattern usually tilted, enjoy side swimming mostly modding continuously.
 19. Echolocation, biosonar mechanism in Susu is sophisticated.
 20. Hunt is school of 1-5 individual round the fish prey to shallow water.
 21. Social life is unique not duplicated by other aquatic animal of the river. The young dolphin is extremely playful, display birth marks, they are often surrounded by mother and nursing mother often encircled by them with great love.
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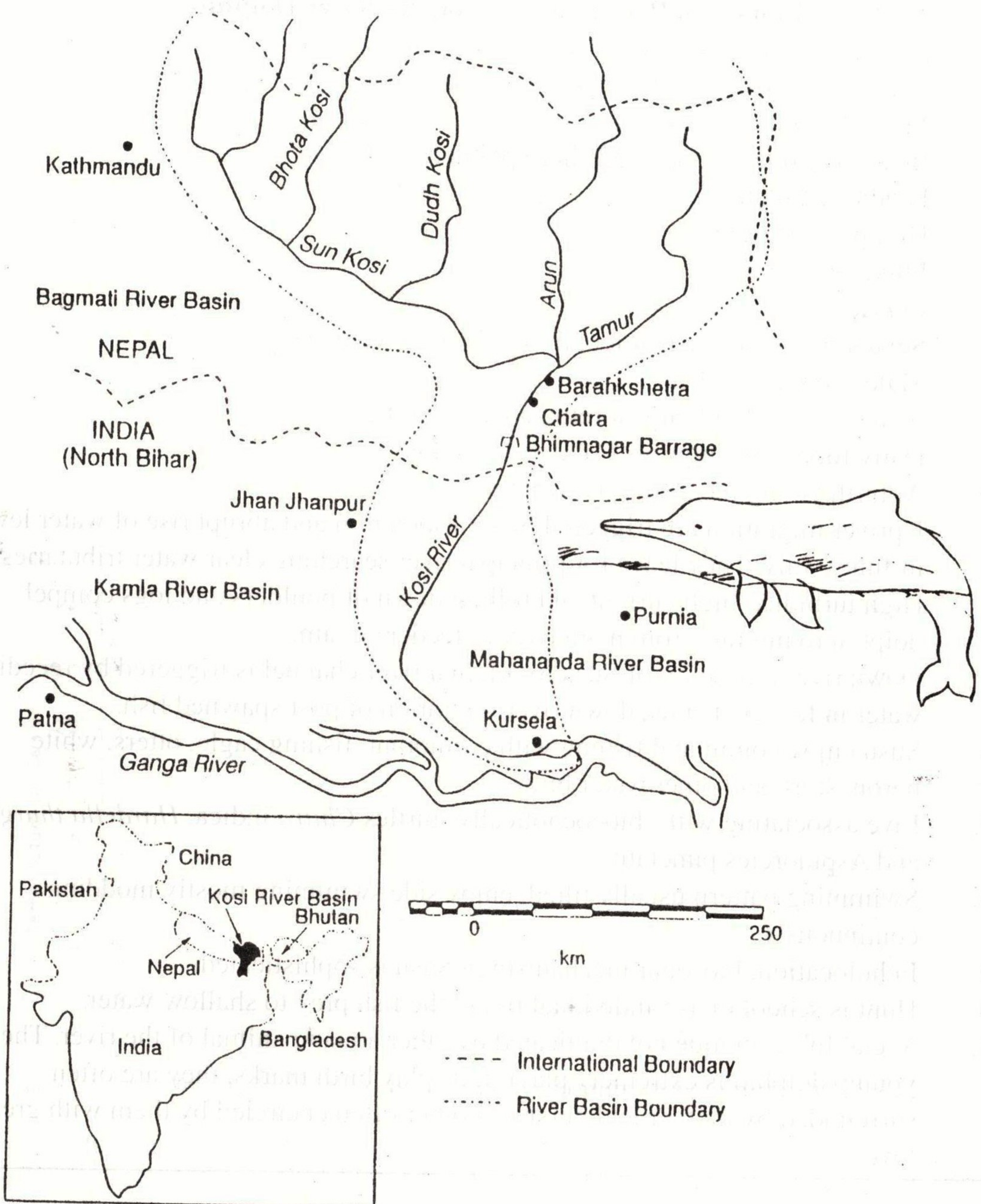
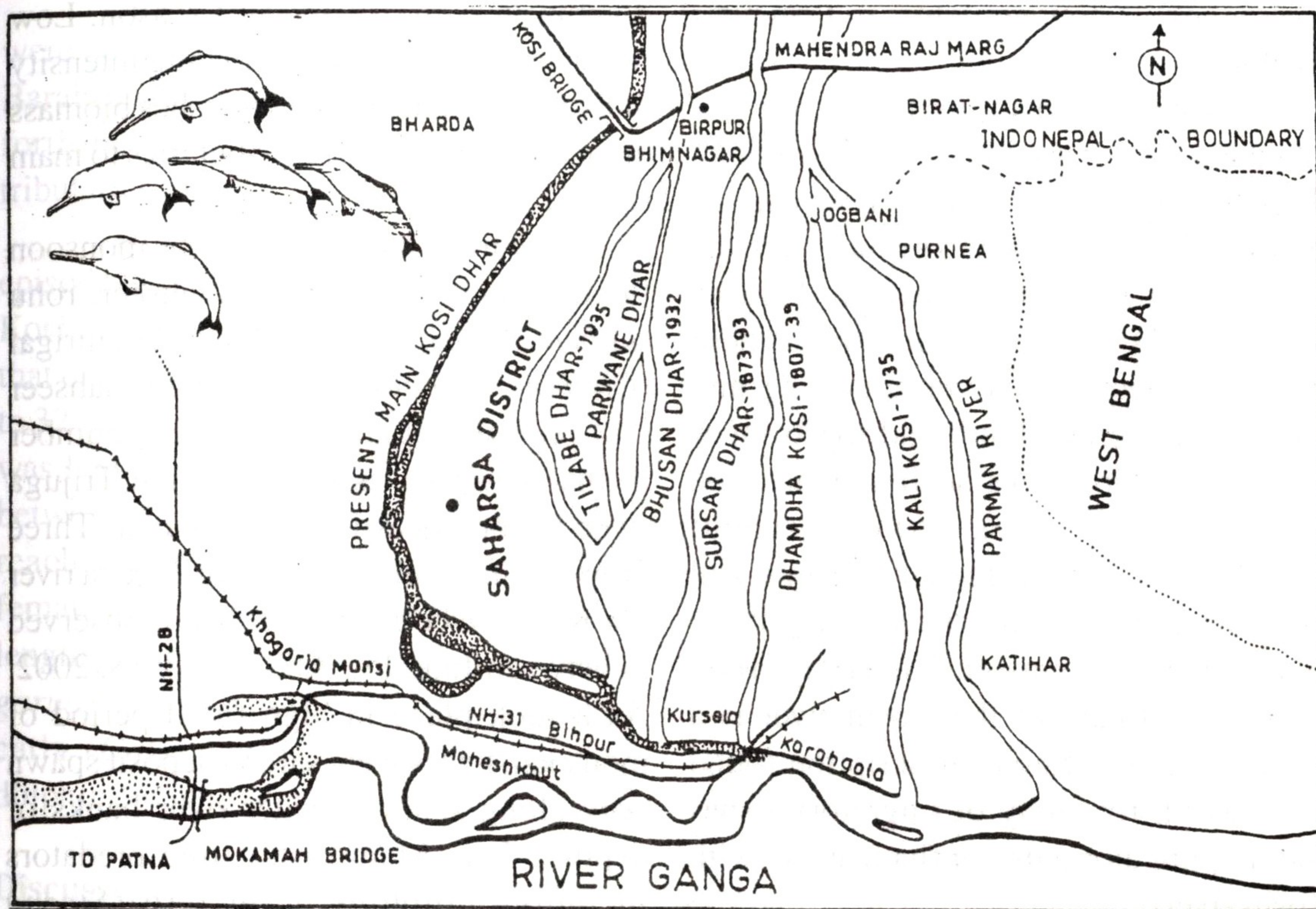


Figure 1. The Kosi River Basin



Observation

Rising as a spring in the Himalayan mountains and gathering strength from countless tributaries, the Koshi river creates a massive floodplain in Terai of eastern Nepal. For thousands of year, it has been life line of Terai area. It had irrigated the agricultural land and shaped the history of the civilization, which grew in the bed of river; today, it is still the basis of the country's agricultural wealth. With its barrages, irrigation canals and interconnected swamp lands, the Koshi river forms huge mass of water body. These vast areas are breeding and feeding ground of fishes, which breed during rainy season from July to September. In the Terai region near Chatra where mahseer, snow trout, eels

descend, top predatory dolphins take special delight to breed and raise their young ones. But in the lower plain areas the bulk of fish migration takes place in rivers, canals, wetlands, lakes and ponds. Major carps and catfishes also undertake seasonal migration. Near Bhardaha, Koshi river is blocked by a barrage and at this spot dolphin wait for opening of flood gates during monsoon. Since the construction of Koshi barrage in 1959 has upset ecological balance of the area by flood regime in the Koshi river, causing degradation of land. Similarly, expansion of irrigated agriculture has added considerable load of pollution due to use of pesticides and herbicides in the water bodies. It has been detrimental to the healthy growth of fish community and

sustenance of top predator as Gangetic dolphin.

Rainfed and springfed intermittent tributaries of the Koshi river increase high biogenic capacity of the river serving as refugia for predatory animal such as dolphins, otters and freshwater shark or Bagarid catfish (*Bagarius bagarius*). These tributaries help cause river spawning and form nursery ground of broad spectrum of migratory major carps such as mahseers. Very little is known, however, about seasonality of these feeder streams and there is a growing concern over fragility of this unique environment. The Trijuga river - a feeder stream of the Koshi river is a stream of this nature or description found to be worth for study of migratory fishes and dolphin along its confluence site with Koshi river.

Additional 8 migratory dolphins were observed in unnamed tributaries near Barahachhetra. They were moving back and forth between main Koshi river and its tributaries.

Because of rapidity of water current and high turbidity of water; the behaviour of dolphin below the water surface is not observable. Seasonal fluctuation of density of dolphin considered from frequency of surfacing animals. Water level of the Koshi river system decrease from October to April and at this time most dolphins and their fish prey are found in the main rivers. In rainy season (June-September) they go to tributaries together with spawning run of fishes. Dolphins enjoy feeding spree in tributaries and get fattened. However, tributary holding enough water support

dolphin in both dry and wet season. Low water increasing drift, net fishing intensity of fishermen and decreasing fishes biomass drive dolphin away from tributaries to main river (Table 2).

During the height of the monsoon flood major carps such as mahseer, rohu (*Labeo rohita*), catla, (*Catla catla*), mrigal (*Cirrhina mirgala*), deep bodied mahseer (*Tor putitora*) aggregated in large number in the spawning assembly of the Trijuga river for broadcasting their spawn. Three spawning migration ascending Trijuga river via Koshi river confluence were observed in between June 15, 2002 to July 18, 2002. As it took place in high flood period of monsoon, fishes were safe to deposit spawn only along shallow water river banks of depth 2-5 m. Many fish eating predators including dolphins, river tern (*Sterna aurantia*), large cormorant (*Phalacrocorax carbo*), Darter (*Anhinga rufa*), otter (*Lutra lutra*) and turtles (*Aspideretes gangeticus*) were seen enjoying feast of fishes. Fishing activity of these animals was delightful to watch.

Dolphin arrived each year between June and September, near Trijuga and Koshi river confluence as year before. This part of the river is considered to be a refuge for feeding resting and rearing young dolphins. A total of 12 individuals were recorded at confluence site Trijuga and Koshi river in July 15, 2002. Resting, and nursery areas of young dolphin calves were detected in shallow water pools 3-5 m deep. Intensive feeding zones were located in deeper water confluence 8-20 m deep, where turbid water and clear water of two rivers was mixing.

Additional 8 migratory dolphins were observed at unnamed tributaries near Barahachetra. They were moving back and forth between main Koshi river and its tributaries.

During head water migratory episode, water surface temperature of main Koshi river fluctuated from 25° to 30° C, that of Trijuga river fluctuated between 28° to 32° C. Current velocity in the Koshi river was 1.5 to 3.5 m/sec, pH of water fluctuated between 6.5 to 8.5. The dissolved oxygen reached almost 4 ppm. Adult male and female dolphin preyed upon fish 15-25 cm length group such as jalkapoor (*Clupisoma garua*), gobid fish (*Glossogobius giuris*), catla (*Catla catla*). The young or calf dolphin foraged on small fishes.

Discussion

Although Anderson (1978), Pilleri (1976), Kasuya and Haque (1972), Shrestha (1995) made extensive study on distribution of dolphin in rivers, little is said about interstream migration of dolphin population. Present study reveals for the first time synchronization of upriver migratory cycle of dolphin with flood cycle of river and mobile breeding fish population in the main river and tributaries. Further, snowfed and rainfed water coupled with murky run off impart peculiar river odour that provide gustatory impulse to fish and dolphin for upriver migration.

Several environmental factors are correlated with the onset of headwater or upriver migration of river dolphins (Shrestha 2002). The sudden changes of water quality, water level, discharge and

temperature have been identified to be important factors triggering migration.

The present author observed a positive correlation between the number of downstream migrating dolphin and decreasing water temperature during the period of stable discharge. Ganges river dolphin exhibit significant habitat shift through their lives. The breeding areas are mostly found in deep pool of large river. After the young is born in May and June river water quality changes due to seasonal rain so also temperature and current velocity. Dolphins begin upriver migration towards river tributary in search of better fish food and nursery for growing youngs. Although feeding condition improve considerably in the new environment of upriver tributaries and river confluences, but the change of the habitat is probably the most critical during their life cycle.

Conclusion

1. To our knowledge, this is for the first time the Gangetic dolphin migratory behaviour has been investigated for such monsoon flood period in such a fine temporal and spatial scale.
2. Between June and August, individual dolphin migrated from main river to tributaries following migration of their fish prey. Most of their time is spent in confluence site of two rivers.
3. During August-September they remained in putative feeding ground of small tributaries hunting and fishing and rearing their calves there.
4. These results increase our understanding of process that underpin

dispersal and will contribute to development of more biologically realistic dolphin conservation and fishery management models.

5. Data also suggest dolphin and migrating fish into brisk spawning period with the subsidence of monsoon flood and lowering of water table in tributary rivers,

they are forced to exhibit post-spawning down river migration.

The author suggests that population of the dolphin show distinct specific behaviour patterns that persist at seasonal scale and are related to the water level, velocity and migration of fish school.

References

Anderson, J. 1978. Anatomical and zoological researches: comprising an Account of the Zoological Results of two expeditions to western Yunnan in 1868 and 1875 and a monograph of the two cetacean genera *Platanista* and *Orcella*. 2 Vols. B. Quaritch, London.

Datta Munsi, J.S. et. al., 1991. The physiography of Koshi river basin. J. of Freshwater Biology 3:(2) 105-122.

Kasuaya, T. and Aminul Haque, A.K.M. 1972. Some information on distribution and seasonal movement of the Ganges dolphin and seasonal movement of the Ganges dolphin. Sci. Rep. Whales Res. Inst. 24: 109-115, pls. 1-3.

Shrestha, T.K. 1986. Ecology of Gangetic Dolphin *Platanista gangetica* in Karnali river of Nepal. In: Nepal Himalaya geo-ecological Perspective, Dr. S.C. Joshi et. al. (ed.). pp 111-142.

Shrestha, T.K. 1995. The Ganges River Dolphin. A study of the wilderness and biodiversity of the Himalayan waters of Nepal. B. Shrestha, Kathmandu.

Shrestha, T.K. 2001. Endangered Dolphins. Shangrila, January-March Issue. Royal Nepal Airlines.

Shrestha, T.K. 2002. Conserving Gangetic dolphin in Nepal. King Mahendra Trust for Nature Conservation. Vol. 5:2.

Table 2

Summary of Dolphin Survey in the Floodplain of Koshi during Flood Period of Monsoon (June 15 to September 15)

River Section Surveyed	River Ecology	Habitat Description	Dolphin Sighted
Koshi at Barahachettra	The shoreline is steep undisturbed. The bed load consists of boulders, pebbles and shingles. The river swollen with turbid water about 200 m wide and 30-50 m deep. Here 3-5 dolphins are seen in the waterfronts of Koshi river near temple of lord Baraha. From this spot Koshi river debouches to Terai plains.	River bank is stable with rocky and sandy bottom. Mostly banks are boulder strewn. The pH of water varies from 6 to 9 and current velocity 3 to 5 m/sec. Fish swarming takes places near so-called Saraswati rivulet and Koshi confluence. Dolphins were seen rounding their fish catch along shallow bank.	8
Koshi river at Chatra near confluence site of Durbasa river	River is meandering creates countless channels and oxbows making summer resort for dolphin. River 200 to 300 m wide channels are seen there.	River bank is unstable, exposed, bottom is covered with pebbles and fine sands. Dolphins are seen hunting and fishing motif occasionally entering oxbows and backwater of pools created by boulders. Many gill net and drift net fishermen capture ripe fish with running eggs. Most fishes seen moving towards clear water oxygeneated tributaries of river to avoid oxygen deficient condition of flood.	2

Koshi river near confluence site of Trijuga river	Floodplain of the river is wide, bottom is sandy. It is about 300 to 400 m wide in flooded condition. Here Koshi river carve out numerous criss-crossing channels.	River bank is unstable habitat is much disturbed water is turbid half solid, half liquid. Drifting material consists of logs, wood, rhizomes, rooted vegetation. About 5 to 12 dolphins are regularly seen. Many gill net and drift net fisherman seen catching spawners. The Trijuga river bankful with water and thick moat of spawners.	12
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Koshi at Bhimnagar Barrage	Koshi river is highly disturbed by human activity. The width and depth varies 200-400 m and 10-20 m. River is broken into number of sister channel. Many fisherman seen plying their boat, drift wood collectors are seen collecting uprooted trees, tree trunks, branches for fire-wood. Occasionally wildlife such as deers, wild buffalo, boars are seen washed away by flood situation in the river cataclysmic.	River bank is sandy and muddy. River water contains a lot of organic material rotten, leaves, debris that suffocates fish and impair their respiration. Fish kills were observed along river banks. Occasionally dolphin calves are seen stranded and lying helpless. The river is not navigable by boat due to strong eddies current, high crest and ripples. Dolphin rescue operation is dangerous not fruitful at all.	3
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Total dolphins sighted	25
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Some observations on Kiang *Equus kiang* Moorcroft in Changthang Wildlife Sanctuary, Eastern Ladakh, Jammu & Kashmir State, India

P. C. Tak and R. M. Sharma

Introduction

Kiang or the Tibetan Wild Ass (*Equus kiang*) belongs to the family Equidae, which contains horses, zebras and asses. The living members of this family are native to central and eastern Asia and Africa, except the Sahara. The family is monogeneric containing a single genus *Equus* (Walker, 1968). According to recent taxonomic and geographic reference on 'Mammal species of the World' by Wilson & Reeder (1993) the genus is represented by nine valid species in the world. In Indian limits, two species occur, viz., *E. onager* Boddaert, 1785 (commonly known as Indian Wild Ass) and *E. kiang* Moorcroft, 1841. The former is found in Thar Desert of NW India and survives as isolated populations in Rann of Kutch in Gujarat whereas the latter occupies the cold deserts of Ladakh and Sikkim.

Kiang is distinguished from Indian Wild Ass by its larger size (120-135 cm at shoulder), darker and redder body colour, narrower dorsal stripe and larger horse-like hooves. It is considered to be closer to horses than to asses as it has short ears, large tail tuft and broad hooves. Like all wild asses, Kiangs have a short upright

mane and a dark stripe along the back extending from nape to tail (Prater, 1971).

However, based on colour and height, some authors consider three geographical subspecies of Kiang, namely, *Equus k. polyodon* occurring in south Tibet and north Sikkim, *E. k. holdereri* found in east Tibet & Szechuan, and *E. k. kiang* inhabiting Ladakh and adjoining west Tibet (Photograph 1).

Within Ladakh, the Kiang inhabits the Changthang area, known for its wildlife, upland plateau and pristine beauty (Julka *et al.* 1999).

Study area

Changthang Wildlife Sanctuary is biogeographically classified under the zone 1A or 'Ladakh Mountains' (Rodgers *et al.* 2000). Physiographically, it is a southwest extension of the Tibetan plateau. The terrain of the sanctuary is rugged with sandy plains, sporadically dotted with vast marshes and surrounded by barren mountains. Its altitude varies from 4000m to 7000m asl. The sanctuary covering 4000 sq km was notified in 1987, which forms a part of the proposed 'High Altitude Cold Desert National Park'. Climatically, it is extremely dry, harsh and hypoxic with

temperature ranging from -40°C to 25°C . During winter, the sanctuary remains under the carpet of snow. In early summer, it is drained by a number of glacial streams emanating from the melting snow, besides the river Indus and its tributaries. The sanctuary area also embraces many important brackish and freshwater lakes, namely, Tso Moriri (now a Ramsar Site), Tso Kar, Pangong Tso, Dungti, Fukche etc, which are generally situated between 4000m and 5000m.

The vegetation of the sanctuary area is composed of 'Alpine Desert Flora' dominated by scrubs, shrubs and sedge-grasses interspersed with *Caragana* species. However, Rawat & Rodgers (1988) states that some high altitude vegetation communities are said to be grazeophil communities, which means the vegetation that has evolved as a result of grazing by wild and domestic herbivores and tolerate grazing.

Methodology

The authors conducted a general faunistic survey in the study area, eastern Ladakh, from 7th to 21st August 2002. The survey covered more than 1000 km using a vehicle. However, only 230-km distance (one side) was traversed in the area inhabited by Kiang. For this distance, the vehicle was driven at a slow speed (15-20 km/hr) to record Kiang sightings. Wherever Kiang(s) were encountered the vehicle was stopped for making proper counts, photographing the animals and scanning the surroundings. Observations were made with the aid of 10x50 power prismatic field binoculars and 1000mm telelens of Questar

make. The photographs were taken using 500mm telelens of Samsung make fitted to a Canon camera.

Habits and habitat

Kiangs are inhabitants of open flat and rolling plains between 3950 and 4850m altitudes. They occur all along eastern Ladakh from valley bottoms to ridgelines mainly covered by sedge-grass meadows interspersed with bushes of *Caragana* species and sparse to dense sturdy grasses of *Festuca* species. They live in herds and seen in open wide valleys avoiding steep slopes of more than 30° inclination. Within Ladakh its distributional range as quoted by Fox *et al* (1991) extends to 6000 sq km and by Chundawat & Qureshi (1999) to 7388 sq km.

It is difficult to distinguish males and females of Kiang from a distance, as both are quite similar in appearance (Schaller 1998). They live in loose groups or herds that often change in size and composition. Generally, a herd comprises adult males and females alongwith their foals. The only stable unit is a female with its foal or yearling. Stallions tend to herd harems and roam about extensively to find the potential mate. Their rutting and foaling period is July-August. The preponderance of solitary animals and smaller group sizes during summer may be due to 'the disruptive time of mating and giving birth'. Further, during summer the food availability is high in the Trans-Himalayan habitat, both in terms of quantity and distribution, which also influences the group size (Schaller 1998, Bhatnagar & Wanchuk 2000). September onwards the

proportion of solitary animals' drops when the effect of rutting and parturition peaks off.

Group size

The existing data from eastern Ladakh on group size of Kiang reveals that during summer it varies from 2 to 84 individuals (Julka *et al.* 1999), 2-74 (Bhatnagar & Wanchuk 2000) and 2-28 (present study 2002). However, in Sikkim Shah (1994) observed an aggregation of more than 500 individuals from autumn to spring. Such aggregations may be the result of either shrinkage in the foraging habitat due to snowfall, colder temperatures and enhanced threat from predators or an anti-predatory strategy (Hamilton 1971, Bhatnagar & Wanchuk 2000).

During the present study a total of 159 individuals of Kiang were counted in 31 sightings, which gives an average group size of 5.13. As many as 16 sightings (51.6%) were of single Kiang, 5 sightings each of the groups consisting of 2-5 and 5-10 animals (16.1%), 3 sightings of 11-15 (9.7%) and the remaining 2 sightings of more than 15 individuals. Usually, the group size observed varied from 2-15 Kiangs (n=13) (Photograph 2).

Population

In fact no census or the absolute count of Kiang population in Ladakh has been carried out till date. All the figures available for its population are basically on population estimates, which in turn are generally arrived at, based on certain assumptions and sample size. For example, Julka *et al.* (1999) sighted 229 individuals in an area of 490 km² with population

density of 0.47 Kiang/km². While Bhatnagar & Wanchuk (2000) counted 365 Kiangs across the distance of 388 km giving an Encounter Rate (ER) of 0.94 Kiang/km. Whilst we encountered 136 Kiangs (after deleting the duplicate/overlap counts) over a distance of 230 km with ER of 0.59.

For quick access and convenience, a comparative account of these three different above mentioned field studies conducted in the recent past (1994-2002) has been prepared and presented in the form of a Table. Segment-wise analysis of the data pertaining to the area reveals that in all eight segments have so far been explored for estimating the Kiang population. These eight segments are 1 Nyoma-Loma segment. 2 Loma-Hanle. 3 Loma-Chushul (this was further divided into two subsegments/sectors, i.e., 3a Dungti-Tsakala & 3b Tsakala-Chushul by Julka *et al.* 1999). 4 Chushul-Lol Yogma. 5 Chushul-Mane (Pangong Tso). 6 Loma-Demchock (upper Indus). 7 Kalang Tar Tar Valley (south of Hanle), and 8 Parma Valley.

Julka *et al.* (1999) counted Kiang in six segments (1, 2, 3a, 3b, 4 & 5), Bhatnagar & Wanchuk (2000) also recorded Kiangs in six segments (2, 3 & 5-8) and we observed Kiangs in five segments (1-5) (Table). Only two segments (2 & 5) were common to all the three surveys, while three segments (6-8) were exclusive to the study by Bhatnagar & Wanchuk (2000) (Table).

Further, analysis of the number of Kiangs recorded in eight different segments of the sanctuary indicate that Loma-Demchock segment has the highest number of Kiangs (249), followed by Dungti-

Table. Showing a comparative account of Kiang sightings by various workers in Changthang WLS, eastern Ladakh, J & K, India.

Segments	Julka <i>et al.</i> (1999)			Bhatnagar & Wanchuk (2000)			Present Study (2002)		
	Area km ²	No. of Kiangs Sighted	Den- sity/ km ²	Approx. distance in km	No. of Kiangs Sighted	Encounter Rate	Approx. distance in km	No. of Kiangs Sighted	Encounter Rate
1. Nyoma-Loma	40	6	0.15	-	-	-	55	29	0.52
2. Loma-Hanle	86	7	0.08	61	9	0.15	61	7	0.11
3. Loma-Chushul	-	-	-	49	19	0.39	49	51	1.04
3a. Dungti-Tsakala	82	104	1.27	-	-	-	-	-	-
3b. Tsakala-Chushul	102	47	0.46	-	-	-	-	-	-
4. Chushul-Lol Yogma	98	42	0.43	-	-	-	20	28	1.40
5. Chushul-Mane (Pangong Tso)	82	23	0.28	70	10	0.14	45	21	0.47
6. Loma-Demchok (Upper Indus)	-	-	-	114	249	2.18	-	-	-
7. Kalang Tar Tar Valley	-	-	-	40	69	1.73	-	-	-
8. Parma Valley	-	-	-	54	9	0.17	-	-	-
Total	490	229	0.47	388	365	0.94	230	136	0.59

Tsakala (104) and Kalang Tar Tar (69) (Table).

The Kiang population in earlier part of 20th century was quite common (Stockley 1936). Due to hunting, demographic pressures and aggression with China in 1962 their numbers started declining in most of their distributional range (Fox *et al.* 1991). In 1988, The Department of Wildlife Protection, Jammu & Kashmir estimated 1500 Kiangs in Ladakh. The Red Data Book on Indian Animals brought out by the Zoological Survey of India in 1994 quotes the population of Kiang over 2000. Subsequent studies by Julka *et al.* (1999) and Bhatnagar & Wanchuk (2000) estimated Kiang population of 1880 and 1847 to 2077 respectively.

However, it appears that the present population of Kiang in Ladakh is facing survival threats due to composite effect of various developmental activities, tourist

influx and livestock pressure. Therefore, the efforts towards moderating these activities would certainly help the existing population of Kiang to thrive for a longer period to come.

Conservation status

Kiang is categorized as an Endangered species in 'Red Data Book on Indian Animals' published by the Zoological Survey of India (1994). This species has been provided the legal protection by placing it under Schedule I of the Wildlife (Protection) Act, 1972 and classified in Appendix II of the CITES.

Acknowledgements

The authors are grateful to Dr. J. R. B. Alfred, Director, Zoological Survey of India, Kolkata and Dr. Arun Kumar, Addl. Director, ZSI, Dehra Dun for encouragement throughout. We are thankful to Dr. H. S. Mehta, Jt. Director, ZSI, Solan for facilities.

References

- Bhatnagar, Y. V. and Wanchuk, R. 1999-2000. *Status Survey of Large Mammals In Eastern Ladakh & Nubra*. In: Mathur, V. B., Bhatnagar, Y. V., Qureshi, Q., Chundawat, R. S., Jackson, R. and Hunter, D. O. *Conserving Biodiversity in the Indian Trans-Himalaya: New Initiatives of Field Conservation in Ladakh*. *Wildlife Institute of India, Dehra Dun* (Unpublished Report). 169 pp.
- Chundawat, R. S. and Qureshi, Q. 1999. *Planning Wildlife Conservation in Leh and Kargil districts of Ladakh, Jammu & Kashmir*. Draft Report submitted to the Wildlife Institute of India, Dehra Dun. 92 pp.
- Fox, J. L., Nurbu, C. and Chundawat, R. S. 1991. The mountain ungulates of Ladakh, India. *Biological Conservation*, **58**: 167-190.
- Hamilton, W. D. 1971. Geometry of the selfish herd. *Journal of Theoretical Biology*.

31: 295-311.

Julka, J. M., Alfred, J. R. B., Mehta, H. S. and Paliwal, R. 1999. Status survey of Kiang (Tibetan Wild Ass) in Ladakh. *ENVIS Newsletter*, Vol. 5: 2-4.

Prater, S. H. 1971. *The book of Indian Animals*. Bombay Natural History Society, Bombay.

Rawat, G. S. and Rodgers, W. B. 1988. Alpine meadows of UP Himalaya: an ecological review. *Proc. Nat. Rangeland Symp.* Jhansi, India. November 9-12, 1987: 119-137 IGFR, Jhansi, India.

Rodgers, W. A., Panwar, H. S. and Mathur, V. B. 2000. *Wildlife Protected Area Network in India. A review (Executive Summary)*. Wildlife Institute of India, Dehra Dun. 44 pp.

Schaller, G. B. 1998. *Wildlife of the Tibetan Steppe*. University of Chicago Press, Chicago.

Shah, N. 1994. Status survey of southern kiang (*Equus kiang polyodon*) in Sikkim. Dept. of Zoology, Faculty of Science, Maharaja Sayajirao University, Baroda.

Stockley, G. 1936. *Stalking in the Himalayas and Northern India*. Herbert Jenkins, London.

Walker, E. P. 1968. *Mammals of the World*. The John's Hopkins Press, Baltimore. Vol. II.

Wilson, D. E. and Reeder, D. M. 1993. *Mammal Species of the World*. A Taxonomic and Geographic Reference. Smithsonian Institution.

Zoological Survey of India. 1994. *Red Data Book on Indian Animals*. Ed. Director, ZSI, Kolkata. 527 Pp.



Kiang *Equus Kiang* Moorcroft in Changthang Wildlife Sanctuary, Eastern Ladakh Jammu & Kashmir state, India



वृत्तात्मक स्मृति-चिह्नों का लोकार्पण करते समय डॉक्टर रामेश बेदी वन्य-जीवों के संरक्षण के सम्बन्ध में अपने अनुभव बता रहे हैं।



भारत में ब्रिटिश हाई कमिश्नर सर रोब यंग के सी एम जी और उनकी पत्नी लेडी कैथरीन डॉ० रामेश बेदी के साथ वन्य-जीवों के संरक्षण के लिये विचार करते हुए।

DEMOGRAPHIC CHANGES AMONG BATS IN AND AROUND JAISALMER OF GREAT INDIAN DESERT

By : Ashok Purohit and K. R. Senacha*

Abstract

A recent survey conducted to explore present status of bats in and around Jaisalmer of Great Indian Desert (The Thar) revealed that this region had seen remarkable change with respect to number of chiropteran species reported four decades back. Out of three microchiropteran species (*Rhinopoma microphyllum kinneari*, *Rhinopoma hardwickii* and *Tapozus perforatus*) reported from the region during the early sixties of twentieth century, two (*Rhinopoma microphyllum kinneari* and *Tapozus perforatus*) have vanished while one new (*Taphozus perforatus*) has occupied the various sites of the region in due course of gaps in bat research.

Key words

Chiropterans, Demographic changes, Jaisalmer, Thar Desert

Introduction

Bats are the most alluring flying creatures of the nature, which adorn the silent nights of the Great Indian Desert (the Thar). Having 1001 species throughout the world bats belong to order chiroptera, the second largest order of class mammalia. They are further divided into two sub orders viz., Megachirotera and Microchiroptera. The Megachiroptera are represented by only one family, the Pteropodidae, which are restricted to the Old World tropics of Africa and Asia and consist of 167 species (Smith, 1977; Mickleburgh *et al*, 1992; Hutson *et al*, 2001). The 834 species of modern Microchiroptera are usually divided into four superfamilies, which indicate the evolutionary affinities among the 17 families (Smith, 1977; Mickleburgh

et al, 1992; Hutson *et al*, 2001). These superfamilies are the Emballonuriodea, which include the Rhinopomatidae, Emballonuridae and Craseonycteridae; the Rhinolophoidea, which include the Nycteridae, Megadermatidae, Rhinolophidae and Hipposideridae; the Phyllostomoidea, which include the Noctilionidae, Mormoopidae and phyllostomidae; and Vespertilionoidea, which include the Natalidae, Furipteridae, Thyropteridae, Myzopodidae, Vespertilionidae, Mystacinidae and Molossidae. There is a fifth superfamily, the Palaeochiropterygoidea that includes three families of fossil Microchiropterans (all extinct), the Palaeochiropterygidae, Archaeonycteridae and Icaronycteridae (Bates and Harrison, 1997).

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Bats are recorded from all areas of the world except the Arctic, Antarctic and few isolated oceanic islands. More than 20% of all mammal species of the world are bats. In many countries bats are major contributors to mammalian biodiversity, while in some, particularly small oceanic islands, they are the only indigenous mammals and may play a vital role as "Keystone" species in ecosystem (Cox *et al*, 1992). The majority of bat species, including most of those in the suborder *Microchiroptera* are insectivorous, although some are carnivorous, a few are piscivorous, and three species of vampire are sanguivorous. Bats of the Old World suborder *Megachiroptera* are predominantly frugivorous, but also consume nectar, flower, leaves and occasionally insects. The New World family *Phyllostomidae* has a similar plant diet, but some species may incorporate a greater proportion of insects than the *Megachiroptera*. Bats are the only mammals with the capacity for powered flight (Altringham, 1996), and the *Microchiroptera*, together with the *Megachiroptera* genus *Rousettus*, have evolved a system of echolocation, by means of which they orient themselves and find their food, and which have enabled them to roost in situations where light intensity is low. In addition, those species living in temperate latitudes are heterothermic and hence able to adapt to food shortage during winter by hibernating; their reproductive cycles have become modified as a result. The most notable reproductive adaptation is a delay in fertilization: mating generally takes place in autumn and spermatozoa are stored in the female reproductive tract until ovulation occurs in the following spring (Racey, 1999).

Worldwide, bats play essential roles in keeping populations of night-flying insects in balance. Just one bat can catch hundreds of insects in an hour, and large colonies catch tons of insects nightly, including beetle and moth species that cost farmers and foresters billions of rupees annually, not to mention mosquitoes in our backyards. Throughout the tropics the seed dispersal and pollination activities of fruit - and nectar - eating bats are vital to the survival of rain forests, with some bats acting as "keystone" species in the lives of plants crucial to entire ecosystems. Wild varieties of many of the world's most economically valuable crop plants also rely on bats for survival. Some of the better known commercial products are fruits such as bananas, breadfruit, avocados, dates, figs, peaches and mangoes. Other includes cloves, cashews, carob, balsa wood, kapok (filler for life preservers), and even tequila. Most of the plants from which these products come are now commercially cultivated, but the maintenance of wild ancestral stocks is critically important. They are the only source of genetic material for developing disease-resistant strains, rejuvenating commercial varieties, and for producing new, more productive plants in the future. The value of tropical bats in reforestation alone is enormous. Seeds dropped by bats can account for up to 95 percent of forest regeneration on cleared land. Performing this essential role puts

these bats among the most important seed-dispersing animals of both the Old and New World tropics. Studies of bats have contributed to the development of navigational aids for the blind, birth control and artificial insemination techniques, vaccine production, and drug testing, as well as to a better understanding of low-temperature surgical procedures (Tuttle, 1988).

Including 13 Mega and 96 Microchiropterans, India harbours 109 species of bats. Surprisingly out of these 109 species, one the major component of the Great Indian Desert, the Jaisalmer (26° 54' 47" N and 70° 54' 52" E) were known to have only three Microchiropterans (*Rhinopoma microphyllum kinneari*, *Rhinopoma hardwickii* and *Tapozus perforatus*) in the early sixties of twentieth century (Prakash, 1963). All three Microchiroptern species were reported from the premises of sonar fort. *Rhinopoma hardwickii* was observed in four unattended rooms of a building while *Rhinopoma microphyllum kinneari* were inhabited in two other rooms of the same; the later were not as numerous as the former. In two other rooms of another building, specimens of *Taphozus perforatus* were found (Prakash, 1963). After sixties till mid of 2001 not much work has been done on distribution and ecology of the bats of this region. In these four decades, this arid region of Thar Desert has seen tremendous change in its eco-biogeography. Rapid increase in human population, introduction of Indira Gandhi canal in the district of Jaisalmer, implementation of advanced technology to

enhance agricultural production, massive growth in construction of new buildings, renovation of historical monuments and urbanization are the reasons which lead to the inhospitable changes in distribution and availability of the bat species in this area.

Environment of the Study site

Our study site, the jaisalmer (26° 54' 47" N and 70° 54' 52" E) lies in the western most part of Rajasthan. Climatically it is a typical hot desert type. During summer the temperature lies in between 25° C to 45° C while in May it rises up to 49° C. The annual average rainfall is 200 mm distributed over less than twenty rainy days. This wide range of climatic conditions has formed different types of habitat for the Chiropterans in and around the Jaisalmer city. Vegetation of the area is of typical desertic shrub forest type represented by *Acacia senegal*, *Prosopis juliflora*, *Euphorbia caducifolia*, *Ziziphus nummularia*, *Grewia tenesc*, *Salvadora persica*, *Capparis deciduas*, *Callotropis procera*, *Anogeissus pendula*, *Maytenus emarginatus*, *Calligonum polygonoides* and *Commiphora wightii*. The main crops of the region include moong (*Vigna radiata*), moth (*Vigna aconitifolia*), guar (*Cyamopsis tetragonoloba*), til (*Sesamum indicum*), and bajara (*Pennisetum typhoides*) which are added with the wheat (*Triticum sativum*) and barley (*Hordeum vulgare*) due to the introduction of Indira Gandhi Canal. (Rahamani, 1997).

Material and methods

We have undertaken an intensive survey from July 2001 to June 2002 to

locate the chiropteran roost in and around Jaisalmer with the circumference of 20 km. radius. Specimens were collected from the different roosting sites in seventy percent alcohol and carried to Conservation Assessment and Management Plan Workshop for South Asian Chiropteran, held at Madurai Kamaraj University, Madurai in the month of February 2002. There they were identified on the basis of morphological measurements by the world-renowned bat taxonomist Dr. Paul J. J. Bates of Harrison Zoological Museum, Kent, England and prominent Indian bat expert Dr. Y. P. Sinha of Zoological Survey of India, Patna. A well planned survey was undertaken in which information about the various bat roost was collected from the local people and a bat detector was used to locate the minute roosts. We used a Global Position System (GPS) to assess the global position of the roosting sites. We are using a Digital Minimum-Maximum Thermometer and a Digital Lux Meter for the microclimatic studies of the bat roosting sites whereas video-graphic count and capture recapture method is being followed for the population dynamics.

Observation and discussion

An extensive survey conducted by us (October 2001 to June 2002) to explore the chiropteran roosts in and around Jaisalmer (26° 54' 47" N and 70° 54' 52" E) has revealed that the number of Microchiropteran species at the study site are reduced drastically from three to two while no Megachiropteran species has been found in the region. Significantly, out of

three Microchiropteran species (*Rhinopoma microphyllum kinneari*, *Rhinopoma hardwickii* and *Taphozus perforatus*) reported from the region during the early sixties of twentieth century, two (*Rhinopoma microphyllum kinneari* and *Taphozus perforatus*) have vanished while one new (*Taphozus perforatus*) has occupied the various sites of the region in due course of gaps in bat research. The detailed account of every roosting site of chiropterans in and around Jaisalmer is as follows :

(1) Annapurana Bhandar, Sonar Fort (26° 54' 47" N and 70° 54' 58" E) :

It is one of the ruined and unattended building site of the most noteworthy chronological tourist place, Sonar Fort of Jaisalmer which inhabits two Microchiropteran species of the region namely *Rhinopoma hardwickii* and *Taphozus nudiventris*. Basically it is a triple storey building meant to store food grains for the soldiers and other workers of the erstwhile ruler of Jaisalmer. Since long back it is unattended and not being repaired, as a result of which it has become a permanent roosts for the Microchiropterans. Although it has two Microchiropteran species but both of these are showing partial segregation in terms of their roost. Ground and first floor of the building are dominated by the *Rhinopoma hardwickii* while wooden ceiling of the second floor is occupied by the *Taphozus nudiventris*. Preferably *Rhinopoma hardwickii* are found to roost in the corners and fore walls of the building while *Taphozus nudiventris* roost in between the mini gaps and linings of the

wooden ceiling (Fig.-1). Both of the species of this roost display different behaviour while interacting with the human intruder. Likewise the *Rhinopoma kinneari*, *Rhinopoma hardwickii* first watches the intruder, move its tail in pendulum like manner, crawls in either direction and finally flies away, while *Taphozus nudiventris* doesn't get disturbed more and remains calm looking towards the intruder. Copulation has been seen in both species during the month of April, which resulted into the parturition during the month of late July and early August.

(2) Raj Mahal Palace, Sonar Fort (20° 54' 51" N and 70° 54' 48" E):

It is the prime attraction for the visitors who come here from India and abroad. In fact it is a triple storied historical building meant for use as administrative block at the time of Maharaja of Jaisalmer. It has an attractive museum consisting of varieties of tools and goods used by the royal family and soldiers. Of course it used to be quite busy throughout the day but three unattended rooms of this building are serving as one of the habitats for Microchiropteran bats. Although it is quite near to the Annapurana Bhandar but instead of the two of latter it has only one Microchiropteran bat species. Ceilings and staircase of this compartment is occupied by a colony of *Rhinopoma hardwickii* (Fig.-2). Previously, up to the starting of 2002 central hall of the building was having almost 300 individuals of this species but they were forced manually to go away from the site as the hall was being repaired to install new section of existing museum.

(3) Rani Mahal Palace, Sonar Fort (26° 54' 42" N and 70° 54' 50" E):

It is the building of the fort, which was used as the residence of Queens of the Jaisalmer King. Basically it is a triple storey building comprising many small rooms and three big galleries. Out of these, five unattended dark rooms and one gallery is occupied by the *Rhinopoma hardwickii*. It has almost thousand individuals. A few days back this building was under resurrection but, significantly, bats of the place did not leave the place. They were sifted to the other rooms of the building during repairing works and they re-occupied the original place soon after its completion. But now the authorities of the fort are trying to get rid of these bats from this building. They are of the opinion that although these bats are not doing any harm to them but visitors are scared of these. Thus they can't afford to leave them inside this building.

(4) Patawa Haveli (26° 54' 58" N and 70° 54' 54" E):

Patawa Haveli is the most alluring visiting spot of the Jaisalmer city. It is a huge multistorey building consisting of five sections. All these five sections are the unique example of engraving. This building was the private property of Patawa family of ancient Jaisalmer, but three of its sections are undertaken by the Rajasthan Tourism Department, Govt. of Rajasthan while other two are still with them and being used as residence. Out of those three, two are open for the visitors while third one is completely ruined and closed from the cautionary point of view. Ceiling and fore walls of few rooms

of ground and first floor of both the prior sections are occupied by scattered individuals of *Rhinopoma hardwickii* while all the rooms of the third section is thickly populated with the same species. The future of these bats is not much safe because recently Rajasthan Government has granted rupees thirty lacs for the renovation of these three sections.

(5) Amar Sagar Garden, Amar Sagar Village (26° 55' 55" N and 70° 52' 17" E):

Amar Sagar is one of the village heritage of Jaisalmer district situated 10 Km away from the city. At one of the edge of this village a half hectare land is maintained for the garden and is owned by the Royal family of the village. Beside one of its fore walls a big water reservoir (Village pond) is there and just aside with that wall it has a ruined building. One of its compartments at the ground floor is occupied by the *Taphozus nudiventris*. Although their number is less and restricted up to fifty but their solitary roost in the area is of significance.

(6) Shri Adinath Jain Temple, Amar Sagar Village (26° 55' 45" N and 70° 52' 18" E):

Shri Adinath Jain Temple popularly known as "Jain Temple" is the most amazing visiting place of Jaisalmer. It is famous for its carving art. It lies on the opposite bank of the Amar Sagar Garden. One of its semi underground portions of store is partially occupied by two species of Microchiropteran bats viz., *Rhinopoma hardwickii* and *Taphozus nudiventris*. Although their number is confined to the

range of hundred but their permanent roost in the premises of this temple is biologically significant. Moreover, an unattained room attached to the boundary wall of the temple is inhabited by a colony of *Rhinopoma hardwickii* consisting of approximately 300 individuals.

(7) Gajroop Sagar Tunnel, Gajroop Sagar Village (26° 56' 50" N and 70° 55' 44" E):

Gajroop Sagar is another village lying in the close proximity of the Jaisalmer city. It has a big water reservoir, which is well known by the Gajroop Sagar Pond. Just aside within a distance of 100 meters towards the Jaisalmer city it has the Main Water Filter Station. A line of hillocks surrounds one of the sides of this pond and has a manmade tunnel to drain outside water into the pond. The ceiling of this tunnel is profusely colonized by the *Rhinopoma hardwickii*. Structurally it is 165 ft long, 4ft wide, 8ft high tunnel and has two openings. So far Microchiropteran roost in and around Jaisalmer is of great interest as it seems most suitable because it is free from human disturbance and has the wild surrounding. Infra-structurally it is so complicated that no one can dare to enter it. Overall we have no doubt to admit it as the safest site for flourishing of Microchiropteran bat colonies. Interestingly now a days it is inhabited by almost 2000 individuals of this bat species.

(7) Gajroop Sagar Well, Gajroop Sagar Village (26° 56' 41" N and 70° 55' 54" E):

An unattended well, lying in between the pond and Filter Station of the

Gajroop Sagar village, is serving as the temporary roost for the Microchiropterans of this region. During the winter it is occupied by the *Rhinopoma hardwickii* while by the end of February when atmospheric temperature increases they vacate it. It is significant to quote here that Microchiropteran bats of the temperate regions undergo hibernation during the winter when atmospheric temperature falls abruptly and food is not available in abundance. During this period they migrate to the wells and other underground locations where the temperature is comparatively high. Throughout the hibernation period they remain lethargic and survive on the reserve fat deposits of their body. As soon as the atmospheric temperature starts rising and conditions become favourable they leave these sites and immigrate to their permanent roosts.

By summarizing the above text we can say that the Jaisalmer, one of the biodiversity hotspot of Great Indian Desert, is not bestowed with the chiropteran species. It lags far behind the Jodhpur (the entrance gate of Great Indian Desert) in terms of number of bat species. On one side where Jodhpur is known to have seven Microchiropteran (*Rhinopoma microphyllum kinneari*, *Rhinopoma hardwickii*, *Taphozus perforatus*, *Taphozus nudiventris*, *Hipposideros fulvus*, *Rhinolophus lepidus* and *Pipistrellus mimus*) and one Megachiroptera (*Pteropus giganteus giganteus*) Jaisalmer stands nowhere by having only two Microchiropteran species viz., *Rhinopoma hardwickii* and *Taphozus perforatus*

(Purohit and Senacha, 2002). Surprisingly it has added one new species (*Taphozus nudiventris*) in last four decades with the great loss of two species (*Rhinopoma microphyllum kinneari*). If we analyse this status with that of Jodhpur we will find that the Microchiropteran species of the Great Indian Desert are declining very fast. By last four decades Jodhpur too has lost three Microchiropteran species viz., *Megaderma lyra lyra*, *Hipposideros fulvus* and *Tadarida aegyptiaca* (Purohit and Senacha 2002). Moreover both the regions have seen a terrific change in their chiropteran roosts. The Jaisalmer has added five new Microchiropteran roosts while Jodhpur has seen broad scale change with this regard and added one Megachiropteran and ten Microchiropteran roosts with the loss of more than five (Fig.3). Interestingly Jodhpur is dominated by the *Rhinopoma microphyllum kinneari* whereas *Rhinopoma hardwickii* dominates the Jaisalmer (Fig.4).

Conservation Status

Both the Microchiropteran species of this region (*Rhinopoma hardwickii* and *Taphozus nudiventris*) are assessed as of least concern in South Asia, as per the Final Report of Conservation Assessment and Management Plan Workshop for South Asian Chiroptera held at Madurai Kamraj University, Madurai, India during 21st to 25th January 2002. But, if we talk over the conservation status of these Microchiropterans in and around Jaisalmer of Great Indian Desert, these might face the severe threat in the near future because, out of eight existing roosts, two are under

resuscitation (Raj Mahal Palace and Rani Mahal Palace) while two other (Annapurana Bhandar and Patwa Haveli) are supposed to resurrect very soon. If so they will face the most adverse condition to search new safer roosting sites. One other roost (Gajroop Sagar Tunnel) known to be safe for *Rhinopoma hardwickii* might face the threat with wild growth of *Prosopis juliflora* at both the openings of the tunnel. Now a days surroundings of this roost are full with the masive growth of *Prosopis juliflora*. It is of worth to quote here that wild growth of *Prosopis juliflora* at the openings of few Microchiropteran roosts in Jodhpur is proving fatal to the species inhabiting them. At one of the Microchiropteran roosts at Jodhpur we were reported that twenty five bats (*Rhinopoma microphyllum kinneari*) died due to their unexpected trapping in the thorns of *Prosopis juliflora* (Purohit et al, 2002).

Conclusion

Overall we can say that *Rhinopoma hardwickii* and *Taphozus nudiventris* are the only species of Microchiropterans reported from in and around Jaisalmer while no other Megachiropterans has been reported till today. It seems that both of these species

are not safe so far as their roosting threats are concerned. It is obvious to recommend here that a major conservation strategy should be implemented in the region to ensure the bright future of chiropteran biodiversity. Preferably the efforts should be made to have healthy talks with the administration authorities of fort, havelies and temples. Moreover, people and youngsters of the region should be educated with regard to the significance and conservation benefits of bats.

Acknowledgement

We are extremely thankful to the Department of Science and Technology, New Delhi for providing us equiment and financial grant for this study in the Project No. - SP/SO/C-28/99. We are also grateful to the management and the wildlife officials of the city for granting permission to conduct the study and Additional Director, ZSI, Jodhpur for providing GPS Unit. We also wish to express our deep sense of gratitude to Dr. B. S. Gaur for his valuable guidance and Dr. Anil Chhangani and Mr. Vijay Krishna Vantipalli of our department for providing valuable help during the study.

Literature cited

1. Altringham, J. D. (1996): Bates - Biology and behaviour. Oxford: Oxford university press.
2. Bates, P. J. J. and Harrison, D. L. (1997): Bats of the Indian Subcontinent. Harrison Zoological Museum, pp. 1-258 (England).
3. Cox, P.A., Elmquist, T., Pierson, E.D. & Rainey, W.E. (1992): Flying foxes as pollinators and seed dispersers in Pacific Island ecosystems. In Pacific Island Flying

Foxes: Proceedings of an International Conservation Conference (eds D.E. Wilson & G.L. Grahm), pp. 18-23. US Fish and Wildlife Service Biological Report 90(23). US Department of the Interior, Fish and Wildlife Service, Washington DC.

4. Hutson, A.M., Mickleburgh, S.P. & Racey, P.A. (compilers) (2001): Microchiropteran Bats: Global Status Survey and Conservation Action Plan. IUCN/SSC Chiroptera Specialist Group. IUCN, Gland, Switzerland, And Cambridge, UK.

5. Mickleburgh, S.P., Hutson, A.M. & Racey, P.A. (eds) (1992): Old World Fruit Bats. An Action Plan for their Conservation. IUCN/SSC Chiroptera Specialist Group. IUCN, Gland, Switzerland.

6. Prakash, I. (1963): Taxonomic and biological observation on the bats of the Rajasthan desert. Records of the Indian Museum, 59 (parts 1&2): 149-170.

7. Purohit, A.; Gaur, B. S. and Senacha, K. R. (2002): Prosopis Juliflora, an emerging threat for the microchiropterans of the Thar desert. Zoo print Journal: Communicated.

8. Purohit, A. and Senacha, K. R. (2002): A review of microchiropteran eco-status in Mandore garden, Jodhpur. Journal of Nature Conservation, 14 (2) : Accepted.

9. Racey, P.A. (1999): Bats The UFAW Handbook on the Care and Management of Laboratory Animals, Seventh Edition (edr - Trevor Poole): 246-261.

10. Rahmani, A. R. (1997): The effect of Indira Gandhi Nahar Project on the avifauna of the Thar desert. J. Bombay Natural History Society, 94(2):233-266.

11. Smith, J. D. (1977): Comments on flight and the evolution of bats. In Hecht, M. K., P. C. Goody & B. M. Hecht (eds.) Major patterns of vertebrate evolution. NATO advanced study institute Series, Series A, Life Sciences, 14. New York: Plenum Press.

12. Tuttle, M. (1988): The World of Bats. America's Neighborhood Bats, University of Texas Press.

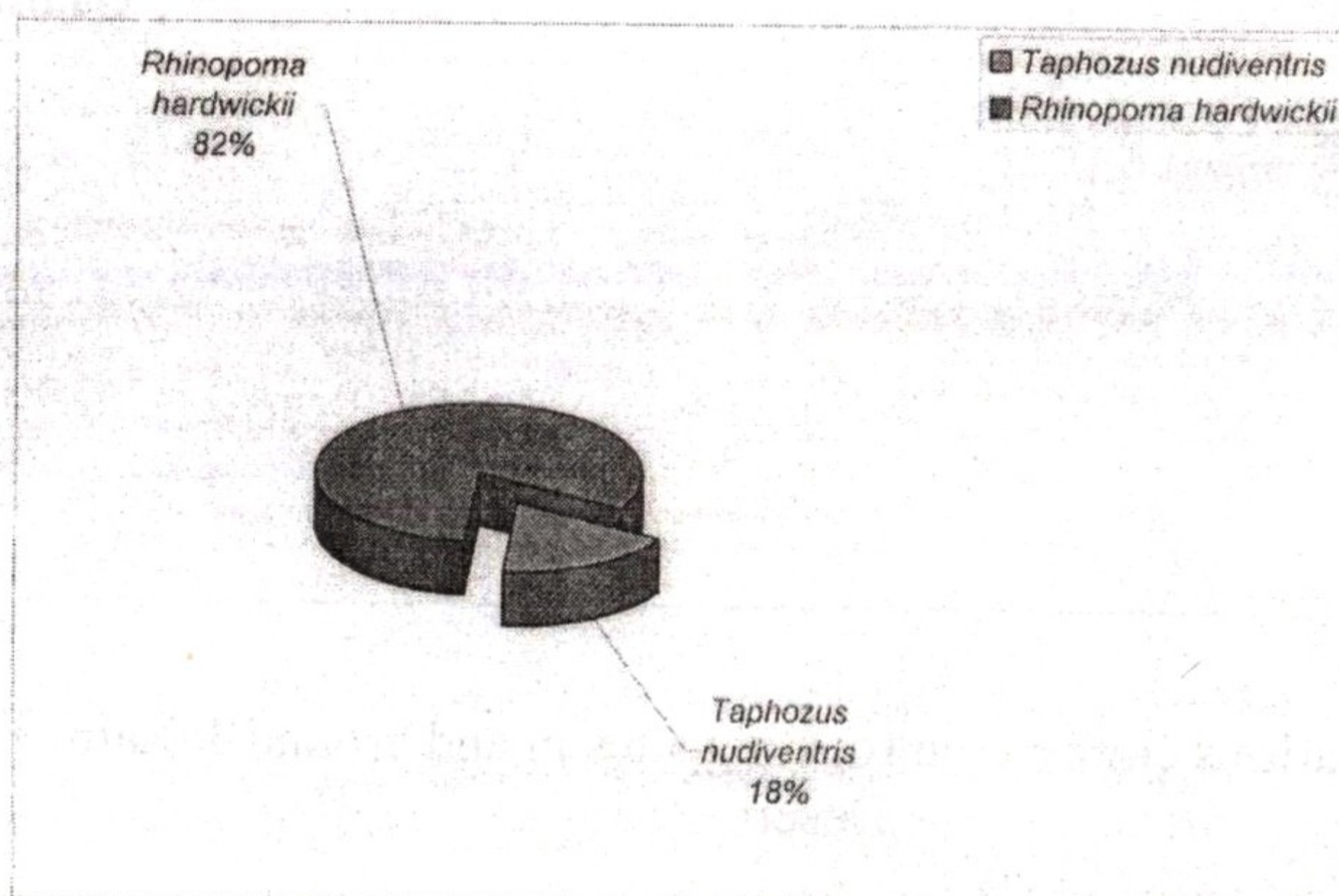


Fig. 4- Pie diagram showing the average composition of bats in and around Jaisalmer.

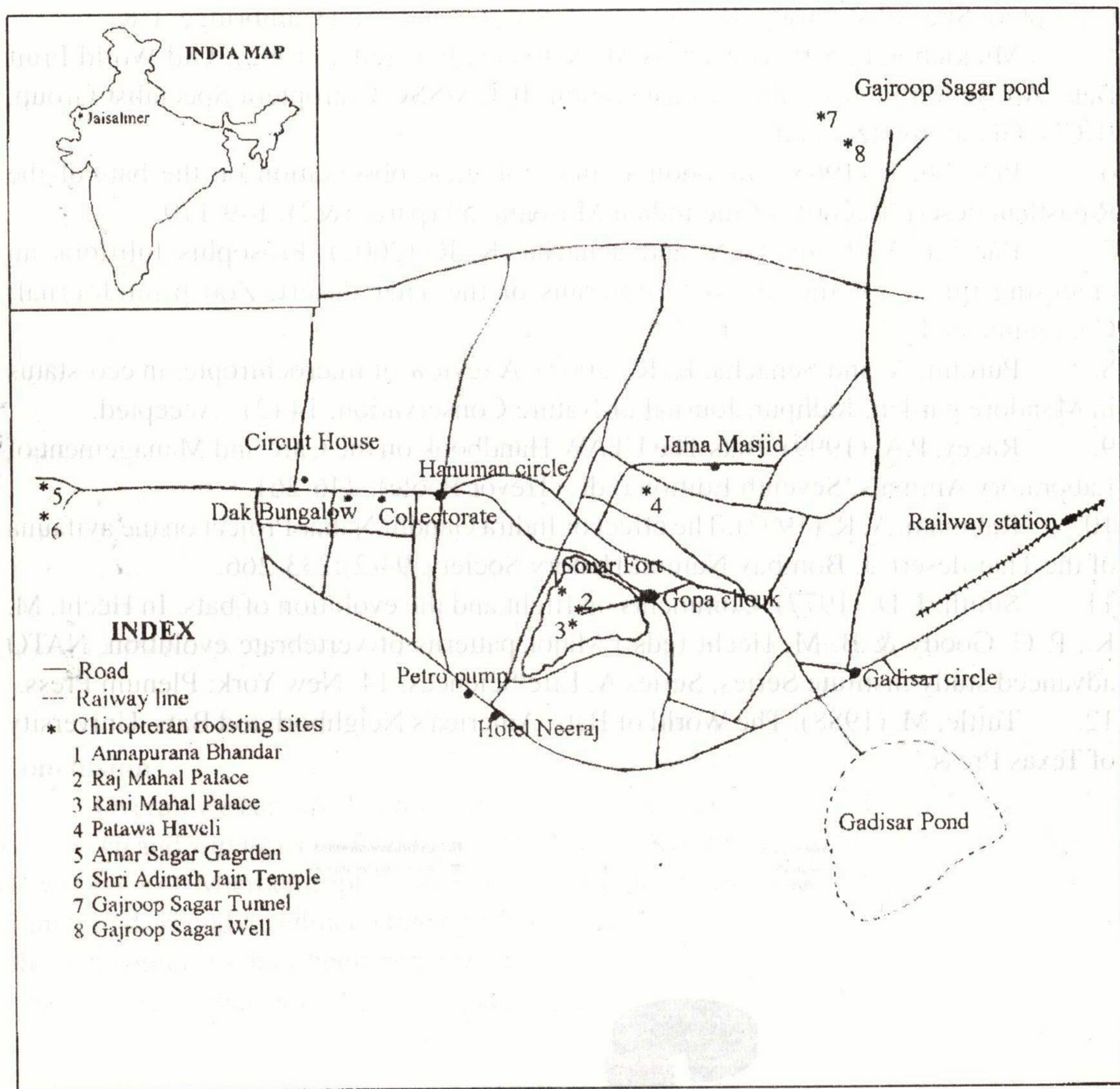


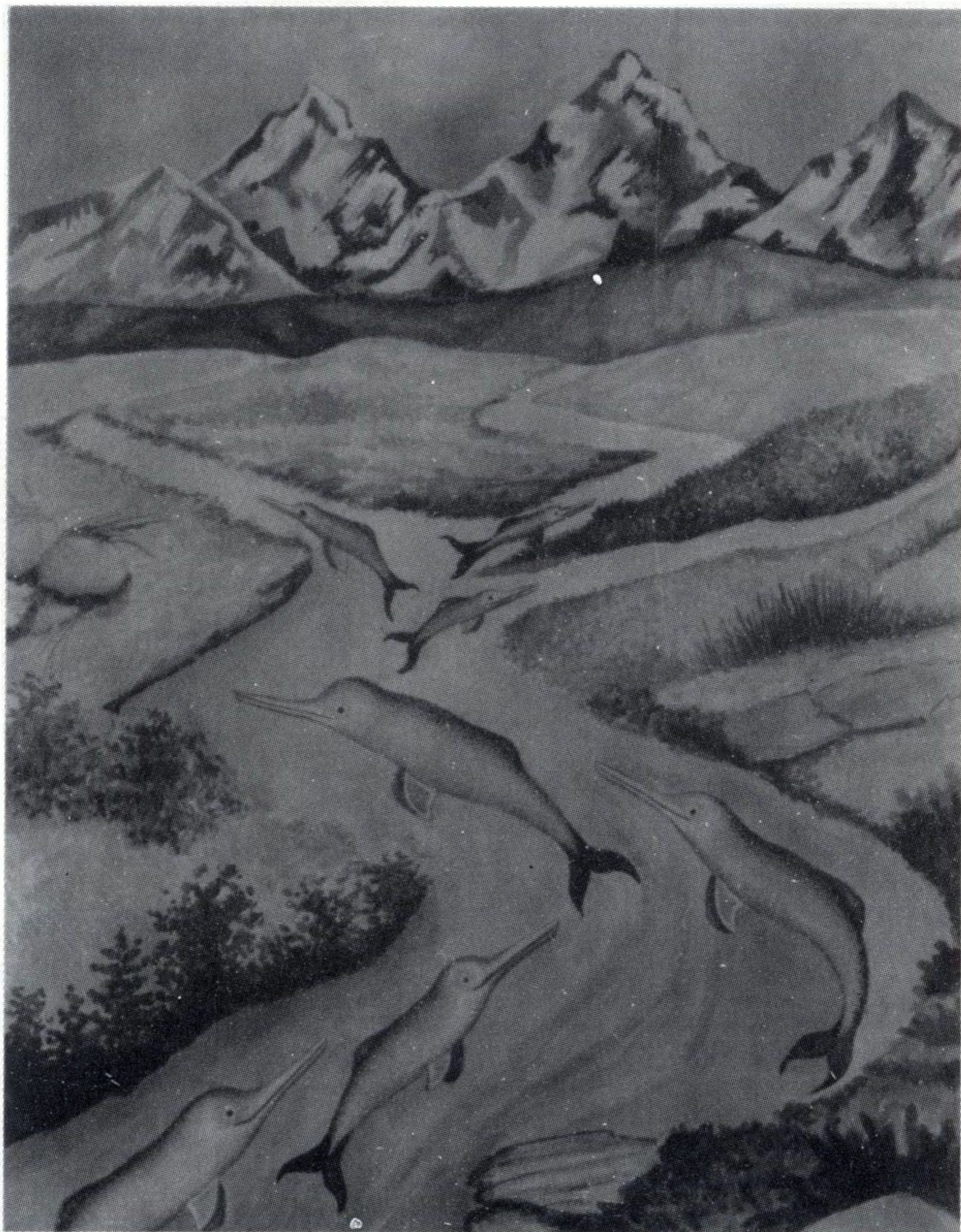
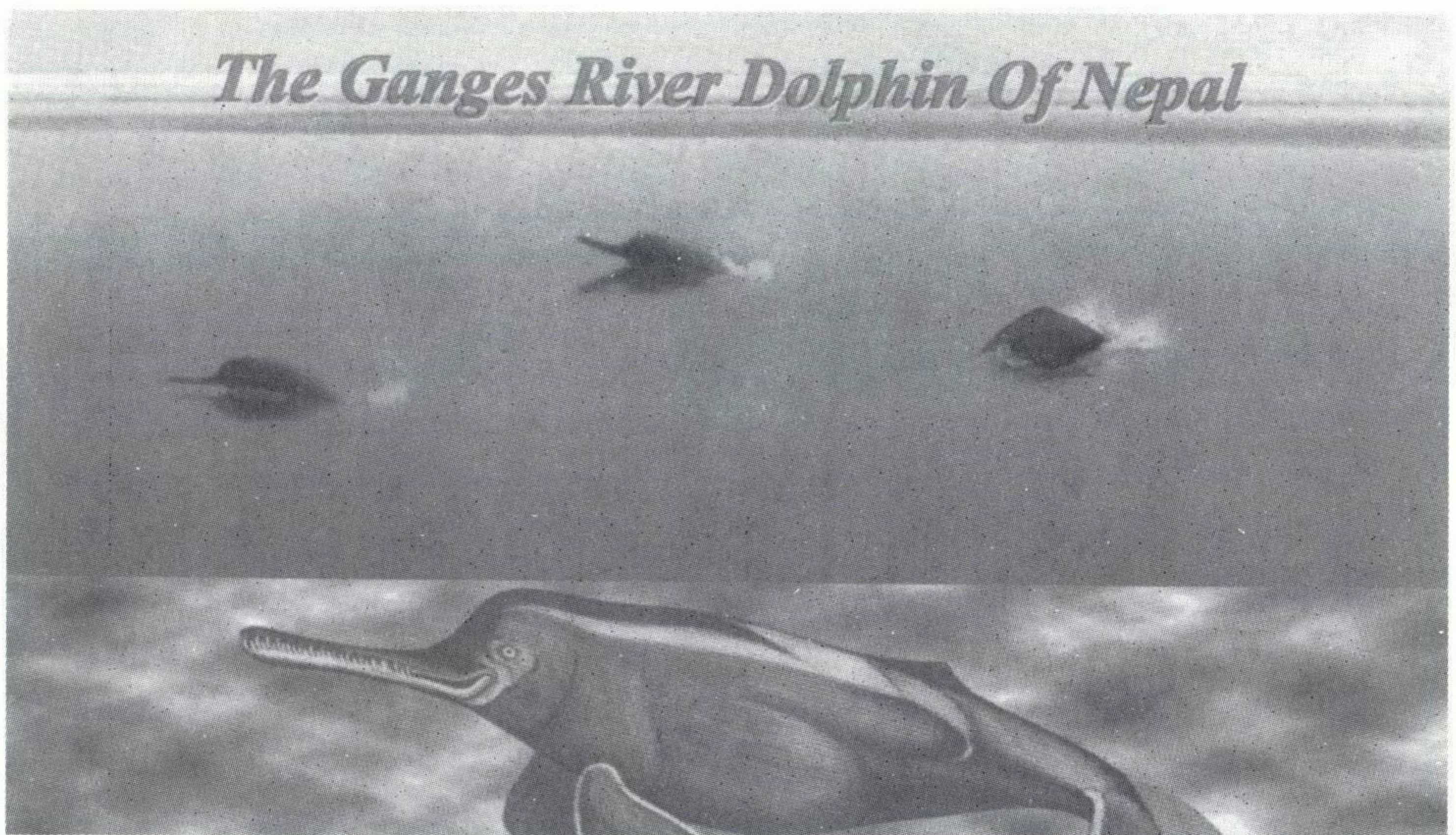
Fig. 3 - Map showing the various chiropteran roosting sites in and around Jaisalmer of Great Indian Desert.



Taphozus nudiventris roosted in between the gaps and linings of wooden ceilings.



A colony of *Rhinopoma hardwickii* roosted on the fore walls of a building.



Showing migration of Dolphin towards head waters of the Koshii river

Fauna of Mewar from Copper Age to Iron Age

By Dr. Raza H. Tehsin*

Dating around 4000 yrs back, Ahar is one of the earliest known civilizations in India, contemporary to the Harrappan civilization. The first evidence of Ahar civilization determined by Carbon Dating dates back to 2000 BC. Romance of the unrevealed past led to the discovery of some 90 sites of this archaic civilization of the banks of Banas river and its tributaries. First excavation took place in mid 1950s by Mr. R. Agrawal (Director of Archeology, Rajasthan). Later it led to a series of excavations on different sites of this riverine settlement, revealing layer after layer of surprises and disclosures.

The first age of this civilization is known as the Copper Age that dates back from 2000 BC to 1200 BC. The period from 1200 BC to 300 BC is known as the Dark Age in which no evidence of civilization has been found.

Then came the Iron Age that dates from 300 BC to 200 AD when there was a marked change by iron coming into use.

The only archeological museum on the excavation site in Rajasthan stands in Udaipur city, on one of the long buried settlements of the ancient civilization of Ahar. A comprehensive excavation and study was undertaken in 1961-62 on the Udaipur site under Mr. H.D. Sakalia and a total area of 8700 sq. ft. was excavated.

Ahar site in Udaipur is situated on the banks

of the river of the same name, Ahar, which is a tributary of Banas. The artifacts and other items excavated from the Udaipur site were properly marked, identified and dated with C 14 Carbon Dating. But what was overlooked was the close scrutinization of terracotta toys and their relation to the fauna of the region of that era. The use and collection of horns and antlers by the people of that time was also not established analogically.

Methodology:

We have tried to decipher the fauna and flora of Mewar region, apart from what has been identified, between Copper Age and Iron Age. The help of terracotta toys, horns and antlers excavated from this site that are exhibited in the museum has been taken.

We have closely scrutinized the terracotta toys and considered that the mentor was an artist and not a naturalist. Therefore he took into account the most catching features of the animals, not going into minute details. The literature published on the site of Udaipur and the paper 'Animal Remains from Excavation at Ahar' has been studied. The figurines of bullocks are of different shapes, colors and with different types of humps. All of them have been identified as domestic cattle similar or Zebu, which might not be the case. E.g. it has not been considered that the upright posture, dark color and massive structure could have been that of Wild Cattle or Gaur. The animal and

bird figures have been compared with different books on animal and birds. Also a detailed study of characteristics of fauna written in the books of natural history has been carried out.

The utility of horns and antlers has been established by consulting the traditional *Akhada* and traditional medicinal books.

The faunal and floral history of Mewar region from Veer Vinod and pre-independent Shikar books written by British hunters and naturalists has been consulted.

Discussion and Result:

This 4000 yrs of history of Mewar bears many geological and natural upheavals that might have resulted in the disappearance of several species. From the excavation study it has been concluded that rice was the main agricultural product for food. This shows that in those days precipitation was very heavy and the area must have had sizable marshy land also which gradually vanished. Studies were conducted on artifacts excavated from the site but the terracotta toys and some other artifacts were not so closely scrutinized. Most of the thrust was given to the bones and skulls. The study is mostly concentrated on domestic animals. Some of the animals identified in the excavation report are as under:

Class - Pisces

Sub-class - Osteichthyses

Order- Teleostei

(Bony fish)

Class - Aves

Sub-class - Carinatae

Order - Galliformis

Species - Gallus gallus (Fowl)

Class - Mammalia

Order - Perissodactyla

Family- Equidae

Species - Equus asinus (Domestic Ass)

Order - Artiodactyla

Family- Bovidae

Species - Bos indicus (Domestic cattle of India)

Sub-Family - Caprinae

Capra aegagrus (Gmelin) race indicus

The Indian Domestic Goat

Species - Ovis Vignei (Blyth) race Domesticus

Domestic Sheep

Family - Cervidae

Species - Cervus duvaucelli

(cuvier) Barasinga

Family - Suidae

Species - Sus cristatus (Wagner) car domesticus (Rolleston)

Order -Carnivora

Family - Viverridae

Sub-family-Mungotinae

Species-Mungos auropunctatus(Hodgren) Mongoose

Family-Canidae Canis Familiaris (Linn)

Domestic Dog

Canis lupus(Linn) Indian Wolf

One of the animals identified and reported in the excavation report is Swamp Deer (*Cervis duvaucelli*). At present the distribution of this animal is in the swampy grasslands of Northern India. This indicates that large tract of this area was swampy with grassland. *Cervis duvaucelli* is now extinct from this region.

The excavation of ivory beads and terracotta toys depicting elephants shows that

elephants were in plenty those days in Mewar region. A small population of these animals survived up till 1907 as mentioned in the British Gazetteer.

A terracotta toy exhibited in the showcase has a similarity with rhinoceros. Its long muzzle with ears far back on the top of the head, almost fused in the toy, resembles that of a rhinoceros. The mentor must have seen the animal in the surrounding jungles and tried to depict it in a toy form. The massive structure and awesome appearance must have inspired and attracted the mentor. The barrel shaped body, short and massive limbs, boat shaped muzzle, ears situated high on top of the head close together shows clearly that the mentor is trying to depict a rhinoceros.

Several toys of bullocks with different structures are exhibited in the showcases. Two of them have a deep and massive body and black color. The muscular ridge upon the shoulders ends abruptly at the middle of the back. Its grand and upright posture is strikingly similar to that of a Gaur (*Bos gauras*). A Gaur has a high ridge along the anterior half of the back, terminating abruptly about half-way between the shoulder and the tail, caused by the spinous process of the dorsal vertebrae being long and those of the lumbar vertebrae short, the change in length taking place suddenly when it raises its head to the max. The awe inspiring look of Bison(Gaur) standing over 6 feet tall with massive body and black color might have inspired the mentor to depict these characteristics by building the massive body and not going into details of its anatomy. On west of Ahar high hills,

clothed with thick bamboo dominated dry deciduous forests, show it to be an idea habitat for Gaur. This may add to the possibility of the presence of Gaur in those days.

A terracotta bird is similar to parakeet. It can be inferred that men in those days used to keep caged birds as leisure pastime, especially parakeets. This shows that keeping caged birds is a very old hobby of man.

An inner core of black buck horn is also exhibited. This demonstrates that the inhabitants of that age used to hunt these antelopes and they were in a plenty. The horns might have been used by the inhabitants for defense and offence. It has been mentioned in old Shikar books by the Britishers that very large herds of Black Bucks were found in Mewar region. My father also told me that he had seen the herds of Black Bucks consisting of 1500-3000 animals per herd as late as 1920s. Herds of 200-300 animals were very common upto early 1950s as were seen by me. But now they have disappeared from the entire Mewar region.

A part of main beam of Sambhar's antler is exhibited in the showcase. Its burr is intact. This reveals that the antler is a shed one. The other side of the antler is burnt. This reveals that in those days the people of Ahar used to collect shed or cast off antlers of deer. The burnt part shows that it had been used for medicinal purpose. Its use has been mentioned in the books of traditional medicines. The burnt out power of antlers has antiseptic property and it stops bleeding. Rubbing the horn in water and

drinking the blend is said to strengthen the bones.

The inference deduced from above analysis is that 4000 yrs back apart from the hilly and ravine forests the area consisted of vast stretches of grassland with sizable marshy land. It has dense undergrowth that harbored Rhinoceros, Swamp Deer, Sambhar, Black Buck, Bison (Gaur) and Elephants in sizable number. Apart from the other present day animals Swamp Deer, Rhinoceros, Gaur and Elephants are extinct from this area.

This is also noteworthy that the hobby of keeping cage birds is thousands of years old. The inhabitants of this civilization might have known the imitating ability of certain birds like parakeets, which they kept as caged pet birds for recreation.

The excavated bones of the birds are identified as that of domestic poultry. During the extensive study of the excavation site, the technology was not that

advanced to decipher the bones by DNA technology. The bones may also have been those of Red Jungle Fowl (*Gallus gallus murgi*). The distribution of Red Jungle Fowl in India by and large, or rather strikingly coincides with that of Swamp Deer distribution. The presence of Swamp Deer, as identified and reported in Archeological Report positively indicates that the distribution of Red Jungle Fowl might have extended upto Mewar region in that era. At present the Grey Jungle Fowl (*Gallus sonneratii*) is found in this region. DNA study of the bones may reveal if the Grey Jungle Fowl and the Red Jungle Fowl were found side by side or not.

The DNA test of the bones of cattle and other animals excavated from the site would enable to precisely identify the species that the bones belong to. The use of this and other advanced technology may bring forth many surprises of the faunal history of Mewar.

References:

- Ali, Salim and Ripley, S. Dillon (1983): Handbook of the Birds of India and Pakistan
- Finn, Frank (1929): Sterndale's Mammalia of India
- Gouldsbury, C.E. (1913): Tigerland
- Hussain, Hakim Muzzaffar (1981): Kitab al Mufardaat
- Prater, S. H. (1980): The Book of Indian Animals
- Pullok, Col. and Thom, W. S. (1900): Wild Sports of Burma and Assam
- Saklia, H. D., Deo, S. B and Ansari, Z. D. (1969): Excavations at Ahar 1961-62
- Sanderson, G. P. (1907): Thirteen Years Among the Wild Beasts of India
- Shamaldas (1886): Veer Vinod
- Singh, K. N. : Indian Elephants - Need For Corridor, Cheetal-Vol. 37, Nos. 1-2
- Woodyatt, Major General Nigel (1922): My sporting Memories

ECOTOURISM IN MADHYA PRADESH

By: Suchitra Banerjee*, Yogesh Dubey** and A K Bhattacharya**

Madhya Pradesh lies in the heart of India covering an area of 3,08,000 sq. km making it one of the largest states in India bordering seven other states - Uttar Pradesh, Bihar, Orrisa, Andhra Pradesh, Maharashtra, Gujrat and Rajasthan.

Madhya Pradesh consists largely of a plateau streaked with hill ranges of Vindhyas and Satpuras. The hills give rise to main river systems - the Narmada and the Tapti flowing from east to west and Chambal, Sone, Betwa, Mahanadi and Indravati from west to east. Intersected by these meandering rivers and dotted with hills and lakes the state is endowed with rich natural setting and variety of landscapes and biodiversity.

Although the modern state of Madhya Pradesh came into being in 1956, its cultural heritage is ancient. The state is also extremely rich in its biological resources. Almost one third of the state is forested and offers unique and exciting panorama of wildlife. Madhya Pradesh also known, as Tiger State is the only state which harbours the largest population of tiger, the most endangered species of large cat in India.

Most of the Eco-tourism, under whatsoever name has been practiced in Madhya Pradesh has invariably been in the Protected Areas. However, due to utter lack

of infrastructure, trained manpower and absence of separate contingent staff for visitors' use and interpretations are other serious impediments in the way of development of Eco-tourism. Even at the established sites tourist often return without exploring and enriching themselves through a variety of experience due to lack of facilities.

Protected Areas, owing to severe pressure and interference stemming from dependence of local people on various resources for their sustenance and livelihood coupled with severe grazing and lopping pressure created by large number of cattle from within and outside the area, tourism becomes a low priority item on the overall agenda of the Protected Area management.

Sharing of benefits with the local people is another issue. Even at highly visited sites the benefits of tourism have not percolated to the host communities, which continue to live in a state of abject impoverishment (Khajurao being a glaring example), this may be because the direct stakes of community living in those areas may not have been taken into consideration while formulating policies and plans. Therefore, while promoting the existing tourist sites and potential new sites as Eco-tourism areas, policies should be

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formulated in such a way that the twin objective of biodiversity conservation and community development is taken care of.

Existing policy

As far as Eco-tourism is concerned there is no exclusive policy designed to see to the interest of this emerging sector both at national and State level. In all those States where Eco-tourism is being practiced to some extent, the compliance, if at all, is by various stakeholders and is only of the tourism policy and other related policies such as those of Wildlife Protection Act, 1972, Forest Conservation Act 1980 etc. What is urgently required, if this sector has to bloom, is that its own policies have to be formulated which would take into consideration all the necessary nitty-gritty of this sector.

In Madhya Pradesh, the only effort towards making Eco-Tourism a viable proposition has been the Eco and Adventure tourism policy formulated by Tourism Department of M.P. The publications are more of a set of tourism guidelines than policies in actual terms. There is no legal mechanism to ensure protection of local culture and communities against the ill effects of improperly managed and ill planned tourism. Proponents of Eco-tourism will have to be extra cautious about this possibility also.

Need for Co-ordination of Activities

It would be impossible to get desired results and meet the broad objectives without establishing linkages between different stakeholders' viz.

hoteliers, tour operators, tourism department, forest department and local people. Therefore, there is a need to galvanize the collective potential of all the stake holders and using their experience gathered over decades in fields related to Eco-Tourism to move forward towards effective implementation of environmental norms in this new regime for better environmental protection and sustainable development.

Identification of tourism sites

All the tourism sites which will cater to the interest of different tourism groups will be identified in phases and thus developed. Some of the identified tourism sites have been mentioned in Table I.

Eco-tourism sites

Similarly the eco-tourism sites of the state will be identified and developed as per the eco-tourism objectives based on site specific eco-tourism plans. Some of the identified eco-tourism sites have been mentioned in Table II.

Tourism circuits

Tourism circuits and packages will be developed integrating the different types of tourism site e.g. integrating heritage of Khajurao with wildlife tourism of Banhavgadh National Park. Some of the identified tourism circuits have been mentioned in Table III.

Eco-tourism facilities

In order to promote eco-tourism for different target groups, particular types of

facilities will be required to be developed under the board framework of eco-tourism. Some of the identified facilities have been mentioned in Table IV.

Operation guidelines

Specific operation guidelines for different stakeholders are required to be developed for effective eco-tourism planning and implementation. A proposed set of guidelines is attached as Table V.

Table 1
Major Tourist Sites

<u>Destination</u>	<u>Tourist interest</u>
1. Bandhavgarh NP	Nature, Historical
2. Kanha NP	Nature
3. Madhav NP (Shivpuri)	Historical, Nature
4. Gwalior	Historical
5. Pachmarhi	Nature, Historical
6. Sanchi	Religious, Historical
7. Amarkantak	Religious
8. Chitrakoot	Religious
9. Maheshwar	Religious
10. Omkareshwar	Religious
11. Orchha	Historical, Religious
12. Ujjain	Religious
13. Mandu	Historical
14. Bodhghat	Religious

Table II
Potential Eco-tourism sites

<u>Destination</u>	<u>Tourism interest</u>
1. Ratapani WLS* (Obedullaganj)	Nature, Historical
2. Kanger Valley NP* (Bastar)	Nature, Historical, Religious
3. Panna NP & adjoining forests (Panna)	Nature, Historical, Religious, Adventure
4. Pench WLS & Sakata-Rukhad forests (Seoni)	Nature

*WLS - Wildlife Sanctuary

*NP - National Park

5.	Noradehi WLS (Sagar)	Nature
6.	Rani Durgawati WLS (Daboh)	Nature, Historical
7.	Satpura NP & Bori WLS (Hoshangabad)	Nature, Religious
8.	Sanjay NP (Sidhi)	Nature
9.	Betul Forests (Betul)	Nature
10.	Tamor Pingla WLS adjoining forests (Sarguja)	Nature
11.	Buffer Zone forests of Kanha Tiger Reserve (Mandla)	Nature
12.	Barnawapara WLS (Raipur)	Nature
13.	Ralamandal WLS (Indore)	Nature
14.	Kheoni WLS (Dewas)	Nature

Table III
Tourism Circuits - Packages

The Panna - Khajuraho Zone :

- | | |
|-------------------------------|--------------------------------|
| - Panna NP | - Ujjain |
| - Panna Forests (Eco-tourism) | - Mandu |
| - Chitrakoot falls | - Ralamandal WLS (Eco-tourism) |
| - Orchha | - Kheoni WLS (Eco-tourism) |
| - Shivpuri Madhav NP | |

The Bhopal Zone :

- | | |
|--------------------|----------------|
| - Gwalior | - Bhopal |
| - Khajuraho | - Sanchi |
| - Ken-Ghariyal WLS | - Bhim Betka |
| | - Bhojpur |
| | - Bhopal Lakes |
| | - Ratapani WLS |
| | - Van Vihar |

The Pachmarhi - Pench Zone :

- | |
|---------------------------------------|
| - Pench WLS |
| - Rukhad-Sakata Forests (Eco-tourism) |
| - Patalkot (Chindwara) (Eco-tourism) |
| - Tamia (Chindwara) |
| - Satpura NP |
| - Pachmarhi |
| - Bori WLS (Eco-tourism) |

The Jabalpur Zone :

- | |
|------------------------------|
| - Amarkantak |
| - Fossil NP |
| - Bandhavgarh NP |
| - Rani Durgavati WLS |
| - Bedhaghat Marble Rocks |
| - Kanha NP (Eco-tourism) |
| - Kanha Buffer (Eco-tourism) |

The Indore Zone :

- | |
|-------------|
| - Maheshwar |
|-------------|

Table IV
Eco-tourism Attractive Facilities

- Eco centres	- Picnic spots
- Nature trail	- Canoeing/boating
- Interpretation inputs	- Elephant rides
- Orientation centre	- Angling
- Visitor centre	- Pony rides
- Museum	- Village visit
- Amphitheatre	- Ethnic/folk dance
- Road-side Markets	- Bird club
- Literature	- Souvenir shops
- Light & sound display	- Cycle trail
- Vehicular Excursions	

Table V
Operation Guidelines

For the Government

- Delineate fringe areas around Pas and forest areas for Eco-tourism.
- The Eco-tourism plan should be prepared by a specially constituted "planning team" with representatives from the tourism department, PA management, Panchayat EDC/FPC/VFC.
- The planning should be flexible, site - specific & participatory and should form part of a larger Eco-regional plan for the area.
- Assessment of existing infrastructure, surface transportation, air service, road, electricity, water supply, law and order situation.
- The Eco-tourism package should invariably include :
 - Simple, adequate boarding & lodging facilities, in tune with the environment & the general setting of the landscape.
 - Road network within the identified tourism zone
 - Self-guided Nature trails
 - Interceptive Centres
 - Way-side exhibits
 - Signages
 - Observation towers
 - Public conveyance
 - Garbage disposal facility
 - Living quarters for staff/personnel
- Structures with an exotic look causing visual pollution and non-compatible and unaesthetic architecture should be avoided.

- Site-specific micro-planning for community based eco-tourism should be resorted to.
- Providing soft loans from the "Vikas Nidhis" to identified beneficiaries.
- Temporary housing structures blending with the surrounding should be encouraged.
- Establishing building codes in consultation with the Panchayats apart from other regulations to ensure pollution free environment, with the concurrence of the respective "Zila Sarkar".
- Environmental, physical & social carrying capacities to limit the various developmental activities in the fringe area to be identified for eco-tourism.
- Devise mechanism to ensure continuous monitoring of adverse effects of tourism for quick redressal.
- Recognize eco-tourism operators, provide incentives to deserving cases and award quality labels.
- Provide visitor information & interpretation services (bilingual) covering :
 - "Dos" and Don'ts"
 - What to see?
 - Where to see?
 (Brochures, leaflets, guide service, visitor centres)
- Periodic training programmes on Eco-tourism should be conducted for tourism administration, planners, operators and general public.
- Ensuring training Programme to the host community in :
 1. Lodge ownership/management
 2. Basic education & awareness
 3. Health development for preparation
 4. Skill development for preparation of local souvenirs
 5. Codes of conduct
 6. Forest and wildlife conservation
 7. Litter control
 8. Forging partnerships with tourists & tourism industry
 9. Environmental management
- To evolve and implement Eco-tourism package in few selected sites initially as pilot projects.

For Tour Operators/Developers :

- To abide by the planning restrictions, codes and standards prescribed by the authorities.
- Implementation of desired environmental principles through regulation.
- Conducting EIA/environmental audits for new/ongoing Eco-tourism projects.

- Being sensitive to the conservation of endangered species & corridor value of the area.
- To ensure construction of structures blending with the environment as per the prescribed building code.
- To take into consideration the carrying capacity & sociological use-limits of the site while creating tourist facilities, and ensuring safety & conveniences of tourists.
- To use local material & design as far as possible, while avoiding over construction.
- The planning, architectural design and construction of tourist facilities should use Eco-friendly techniques, viz., solar energy, recycling of garbage, harvesting of rain water, natural cross - ventilation instead of AC, self-sufficiency in food through kitchen garden & farming.
- Energy & water saving devices should be used apart from controlled sewage disposal.
- Control of noise pollution, chemical pollution and air emissions.
- Use of signages / boards as per the standard prescriptions in the code.
- Reduced use of environmentally unfriendly items like asbestos, CIS, pesticides, inflammable material.
- Respecting the historic & religious sites in the area.
- Providing appropriate interpretation service to visitors for communication with nature & local culture.
- Ensuring proper marketing of eco-tourism products.
- Ensuring training of staff on environmental issues.
- Ensuring safety & security of visitors
- Respecting local inhabitants, culture & involving them in various activities & vocations as far as possible.

For the Visitors

- Abiding by the code of conducts, "Dos" & Don'ts"
- Helping conservation, apart from protecting any site natural or cultural, which may be adversely affected by tourism.
- Avoiding wastage of resources.
- Avoiding littering & carrying back all non-degradable litter.
- Leaving the camp sites clean before departing.
- Avoiding removal of plants, seeds drift-wood from the site.
- Respecting local culture/customs.
- Respecting holy places.
- Strictly adhering to the safety precautions.

For Host Community

- Respect the value of environment, cultural heritage.
- Avoid overusing the area
- Cooperate with the authorities in ensuring healthy Eco-tourism.
- Realize & react to the threat of investors who see opportunities & exploit the locals.
- Be friendly with the visitors as effective "nature guides" & "conservationists".

Note - The information furnished in the above tables are based on the unpublished communications by H S Pabla, Chief Conservator of Forests, and Suhash Kumar, Conservator of Forests, Madhya Pradesh.

Population fluctuation and ecology of Indian flying fox

(*Pteropus giganteus giganteus* Brunnich, 1782) in Jodhpur, Rajasthan.

Jeeva Ram Tak and Sumit Dookia*

Abstract

Indian flying fox (*Pteropus g. giganteus*) shows local migration from one site to another in winter and summer season. They show rhythmic movement on branches to protect themselves from heat and cold.

Introduction

Out of the different species of fruit bats reported from Indian subcontinent, the only representative of fruit bats is *Pteropus g. giganteus* in Thar Desert of Rajasthan. They belong to the order Chiroptera (Megachiroptera) of class Mammalia.

There are 1001 species of bats present throughout the world and about 104 species are found in India, out of which 12 are fruit bats and remaining 92 are insectivorous bats. Though three fruit bats are found in Rajasthan but only one is found in Thar Desert of Rajasthan (Sinha, 1996).

When they are on foraging paths, they visit flowers to feed upon nectar and serve as pollinator. They pick up fruits from trees, carry them away and drop the seed at different localities, far away from parent trees, serving as a mode of seed dispersal.

Jodhpur, the gateway of Thar Desert, lies between 26° 18 N and 73° 08 E on eastern fringe of desert. Previously these flying foxes were observed only at Balsamand Lake Palace, 8 km away from Jodhpur city, only place in entire Thar Desert (Prakash, 1963).

But now there is another roosting colony present, inside a backyard garden of Rail Sadan (A residence of Divisional Rail Manager). They roost here on 14 different trees. This colony was formed 8-10 years ago and at present it is the largest colony as compared to Balsamand Lake Colony.

In this study, population fluctuation, feeding i.e., and roosting plants were observed for 6 months from November 2001 to April 2002.

Material and Methods

Study Sites :-

Two study sites were selected for studying all these parameters. One was the Rail Sadan (A residence of Divisional Rail Manager) at Jodhpur and another was at Balsamand Lake Palace. Long term data were collected from Rail Sadan locality

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whereas Balsamand sites were observed to trace out the population fluctuation.

To study all the above mentioned aspects, some parameters were drawn to collect data.

Population Demography

Total Count :- All roosting trees were scanned in daytime. On each tree, bats were counted by repetitive counts (Rodgers, 1991; Sutherland, 1996).

Ecological parameters :- Temperature and relative humidity were measured with the help of maximum and minimum digital thermometer. Light intensity was noted on every visit with the help of Taiwan made Lux meter.

Foraging activity :- Fruiting trees were randomly observed in the night by detecting them through loud noisy call and flying direction.

Observation and Results

Roosting preference :- All the bats were showing a very well roost site attachment and were not leaving the place during daytime. For the whole day they mainly roost on the trees of *Azadirachta indica* (Neem), *Pithecarium dulce* (Vilaiti amli), *Albizia lebeck* (Siris), *Saraca asoca* (Ashoka), *Ficus reliogiosa* (Peepal) and *Syzygium cumiri* (Jamun).

Though trees were present in sizable number in the whole garden but bats

preferred to roost on backyard trees only.

Daily rhythmic activity :- During summer when the sun rays directly fall on the top of the trees, bats usually roost at the middle of the trees under the foliage where temperature is comparatively low and humidity high. In winter for the whole day they roost superficially over the foliage of trees where the temperature is comparatively high.

During winter days most of the bats cover their head with the wings and take rest for a long time, while in summer they seem active and make their wings up and down to over come the stress of heat of the atmosphere. For protecting themselves from excessive heat, they salivate on their body in an attempt to reduce body temperature.

In the evening they move towards the top of the trees and roost on the part of tree facing sunlight. During the sunset time they concentrate on the brighten portion of the tree and wait for the darkness. As soon as the light intensity goes zero they start their emergence for the foraging activity (Table 1).

Just before emergence some bats start making noise and make a round over the roosting site, soon after this they start their emergence and leave the roost in small groups in all the directions. After foraging they return back at the roosting site in late night.

Table - 1
Emergence time and sunset time during the study period.

Date	Emergence time	Light intensity time (at Zero Lux)	Sunset time
26.11.01	6:16 pm	6:10 pm	5:42 pm
08.12.01	6:14 pm	6:09 pm	5:42 pm
19.01.02	6:35 pm	6:30 pm	5:59 pm
08.02.02	6:55 pm	6:50 pm	6:20 pm
13.03.02	7:10 pm	7:09 pm	6:42 pm
09.04.02	7:28 pm	7:20 pm	6:54 pm

Roosting population and microclimate study :- Monthly data for population dynamics and ecological parameters (temperature and humidity) are shown in Table 2.

Table - 2
Number of individuals with temp. and relative humidity.

Date	No. of individuals	Daily Max. Temp. (°C)	Daily Min. Temp. (°C)	Daily max. relative humidity (%)	Daily min. relative humidity (%)
26.11.01	1202	25.5	14.0	46	27
28.12.01	1199	27.4	15.8	61	43
09.01.02	1491	22.5	15.5	50	34
08.02.02	1265	19.8	19.4	26	26
13.03.02	460	31.5	20.0	47	23
09.04.02	216	35.3	21.6	63	21

Discussion

By making a critical examination of Table 2, it shows that the number decreases drastically, while at another roosting site of Jodhpur, Balsamand Lake Palace garden, population increased in summer (Purohit and Senacha, personal communication). In winter high population was recorded at Rail Sadan locality and low at open site Balsamand.

So we conclude that Indian Flying

Foxes show seasonal migration with the availability of food and better warm place. Bastewde and Mahabal (1976) also supported it.

Prakash (1963) suggested that bats show daily rhythmic movement on branches by protecting themselves from temperature and humidity. Neuweiler (1969) supported us as he also saw a special way of heat regulation by salivating on the body.

Generally every flying fox takes water during their first emergence flight in summer, so a water body close to roosting site is necessary ; Prakash (1963) and Bates *et. al.* (1999) supported our observation.

As a conclusion we can say that *Pteropus g. giganteus* shows a mass migration for protecting themselves from low temperature and availability of food. They never feel insecured even when they inhabit places close to human habitations. On the contrary they prefer to live close to populated colonies or even noisy market places.

Acknowledgement

We are very much thankful to Head, Dept. of Zoology, J.N.V. University for permitting us to do such work. JRT is highly thankful to Dr. A. K. Purohit, Asso. Professor and Mr. K. R. Senacha, Research Scholar, for technical support and proper guidance to him. Dr. Shalini Gaur for her help during preparation of this manuscript. Mr. Gurdeep Singh, Divisional Commissioner of Railways, Jodhpur Division, and Incharge of Balasamand Lake Palace for permitting to study inside their gardens.

Reference

1. Bastawde, D. B. and A. Mahabal (1976). Some behavioural aspects of the Indian flying fox *Pteropus giganteus giganteus*. *Bio-Vigyanam*, 2(2): 209-212.
2. Bates, P. J. J.; D. L. Harrison and M. Muni. (1999). The bates of western India revisited : Part I. *J. Bombay Nat. Hist. Soc.*, 91(1): 1-15.
3. Neuweiler, G. (1969). Verhaltensbeobachtungen an einer indischen Flughundkolonie (*Pteropus g. giganteus* Brunn.). *Z. Tierpsychol.*, 26: 166-199.
4. Prakash, I (1963). Taxonomic and biological observations on the bats of Rajasthan desert. *Rec. Indian. Mus.*, 59 (1&2): 142-170.
5. Rodgers, W. A. (1991). *Techniques for wildlife census in India: A field manual*. (Ed.), Wildlife Institute of India, Dehradun. 82 pp.
6. Sinha, Y. P. (1996). Bats in Indian Thar Desert. In *Faunal diversity in the Thar Desert: Gaps in research*. (Eds. A. K. Ghosh; Q. H. Baqri and I. Prakash.): 349-352 pp.
7. Sutherland, W. J. (1996). *Ecological census techniques: A handbook*. (Ed.), Cambridge University Press, London. 336 pp.

Mammals of Govind Wildlife Sanctuary and National Park, Uttarkashi (Uttaranchal)

By

J.P. Sati*

INTRODUCTION

Uttaranchal is known for its rich and varied heritage since immemorial. Of the total geographical area, the state has nearly 60% forested land, which provides suitable habitat to the fauna inhabiting in it. Variety of animal species is found in this landmass right from unicellular protozoan to the big mammals. But when we talk about the fauna of the Govind Wildlife sanctuary and National Park (GWS & NP) in general and mammals in particular it was found that the very little information is available on it.

Besides some stray records in the old literature, Dang (1968) was first to published a preliminary report on ecology of Har-ki-dun and adjacent valleys, with special reference to Bharal and Red (Brown) Bear. Thereafter Fox et al. (1968) and Wildlife Institute of India surveyed the sanctuary under Snow Leopard survey and reported 11 species of mammals. Sathyakumar (1994) reported about 20 species of mammals from Rupin and Supin valley of the sanctuary. Recently Sinha (1995) reported nearly 35 species of mammals from Uttarkashi district, which includes the sanctuary area but the actual number of species from the sanctuary is not specified in it. Thus in this communication an attempt has been made to present a detail

account of the mammals so far been reported by various workers in the past and the recent sightings made by the author during different faunistic surveys to the area.

STUDY AREA

The Govind Wildlife Sanctuary and National Park (GWS&NP) is situated in the Uttarkashi district of Uttaranchal at the interstate boundary of Uttar Pradesh and Himachal Pradesh precisely between Latitude $31^{\circ} 17' 30''$ and $35^{\circ} 55''$ N and longitude $77^{\circ} 47' 30''$ and $78^{\circ} 37' 30''$ E (Map). It is spread over an area of 957.969 sq. km. and forms the upper catchment of the river Tons. Two major rivers, the Rupin and the Supin flow through it and joins together at Naitwar to form the river Tons. The altitude varies from 1300 (Naitwar) to 6323 m. (Banderpunch).

Initially the sanctuary used to be known as Tons Pashu Vihar, which was later renamed as Govind Pashu Vihar (GPV). Govind Pashu Vihar was notified in the year 1954 and established on 1st March 1955 with an area of 472.08 sq. km. The then Government of Uttar Pradesh notified the higher ridges of the Sanctuary, above 3500 m. altitude, which is also the best habitat of Snow Leopard, the National Park in 1991 for conservation of the Snow Leopard.

*Zoological Survey of India, Dehradun (U.A.)

The climate of the area is typical Himalayan with average rainfall 1500 mm. during July to August. There is extreme cold with three to four months snowfall in winter. Higher reaches of the Sanctuary have permanent snow cover.

The vegetation pattern of the area resembles with broad vegetation pattern of Northwest Himalaya, which broadly can be divided in to three altitudinal zone viz., Temperate broad leave forest (1300-2500 m.), Sub-alpine mixed coniferous forest (2500-3000m) and Alpine scrubs and meadows (3000 m. and above).

OBSERVATION AND RESULTS

Present findings are based on the extensive surveys carried out by the Zoological Survey of India, Dehradun during the years 1993 to 1996. Nearly 10 to 20 days field trips were made to different parts of the sanctuary during different seasons to work out the mammalian fauna. During the survey localities like Naitwar, where river Rupin and Supin joins each other; Himri, Dhaula, Istragad, Duni, and Masri along river Rupin; Sankri, Jakhol, along river Supin; Taluka, Osla and Har-ki-Dun on Har-ki-Dun trek and Few localities on Kedarkantha trek (1300m to 3000m) were surveyed and observations made. Both field binocular and telelenses with camera were used for spotting of animal and their photography. Direct and indirect (calls, feacal and scat samples) observations reveal that the mammalian fauna of the area ranges from small Pygmy Shrew and Pipistrelle Bat to the larger animal like Asiatic Black Bear and Sambar Deer. In all, 32 species of mammals

belonging to 29 genera, 16 families and 7 orders have been listed from the area. The scientific name of each species is followed by its common name, first reference, type locality, and distribution in India and in the study area. Conservation status to those species, which come under threatened category, has also been provided,. The classification and first reference has been followed after Wilson and Reeder (1992) and distribution in India and conservation status after Alfred, et al. (2002).

Systematic Account

I Order : Insectivor

1 Family : Soricidae

1. Genus : *Suncus*

1. *Suncus etruscus* (Savi); Savi's Pygmy Shrew; Pygmy White-toothed Shrew 1822. *Sorex etruscus* Savi, *Nuovo Giorn. De Letterati, Paris*, 1:60.

Type locality: Pisa, Italy.

Distribution: India: Himachal Pradesh to Northeastern states.

Sightings : Only once seen at Naitwar (1450 m).

2. *Suncus murinus* (Linnaeus); House Shrew

1766. *Sorex murinus* Linnaeus, *Syst. Nat.*, 12th ed., 1:74

Type locality: Java, Indonesia.

Distribution: India: Throughout.

Sightings: One individual seen at Himri (1350)

II Order : Chiroptera

2. Family: Pteropodidae

2. Genus: *Cynopterus*

3. *Cynopterus sphinx* (Vahl). Short nosed Fruit Bat 1797 *Vespertilio Sphinx* (Vahl), *Skr. Nat. Selsk. Lopenhagen*, 4(1) : 123.

Type locality: Travancore, Tamil Nadu, India

Distribution : India : Throughout.

Sightings: Observed at Naitwar, Himri and Duni between 1450-1900 m Altitude.

3. Family: **Vespertilionidae**

3. Genus: **Pipistrellus**

4. **Pipistrellus babu** Thomas; Pipistrelle Bat 1915. *Pipistrellus babu* Thomas, *J. Bombay nat. Hist. Soc.*, **24**:30.

Type locality: Murree (2438m.), Rawalpindi, Pakistan.

Distribution: India: Assam, Sikkim, Kumaon, Himachal Pradesh and Madhya Pradesh.

Sightings : Colonies of Pipistrelle seen active at dusk near Naitwar, himri and Duni at an altitude of 1450, 1530 and 1900 m respectively.

III Order : **Primates**

4. Family : **Cercopithecidae**

4. Genus : **Macaca**

5. **Macaca mulatta** (Zimmermann); Rhesus Macaque

1780. *Cercopithecus mulatta* Zimmermann, *Geogr. Gesh. Mensch. Vierf. Thiere*, **2**:195

Type locality: Nepal Terai, India.

Distribution: India: North and East India above Tapti and Godawari.

Sightings: Nearly 8 groups of 4 to 40 individuals were observed near Naitwar, (1480m), Himri (1550m), Dhaula (1600m), Duni (1900 m). Masri (2150 m), Istraged (2075 m) Taluka (2100 m), Sankri (1850 m) and Jakhol (2400 m).

5. Genus: **Semnopithecus**

6. **Semnopithecus entellus** (Dufresne); Hanuman Langur

1797. *Simia entellus* Dufresne, *Bull. Sci.*

Soc. Philom. Paris, Ser. 1,7:49

Type locality: Bengal, India.

Distribution: India: Practically throughout in suitable localities. *Status: CITES-Appendix I.*

Sightings: Six groups of 8 to 25 individuals and two solitary ♂ were observed at Naitwar (1450m), Dhaula (1600 m), Istragad (2075 m), Sankri (1850 m) and Kedarkantha Trek (2700 m).

IV Order: **Carnivora**

5. Family: **Canidae**

6. Genus: **Canis**

7. **Canis aureus** Linnaeus; Asiatic Jackal; Golden Jackal

1758. *Canis aureus* Linnaeus, *Syst. Nat.*, 10th. ed., **1**: 40.

Type locality: "Oriente" restricted by Thomas (1911) to "Bema Mountains", Laristan, South Persia (Iran).

Distribution: India: Bihar, Gujarat, Haryana, Madhya Pradesh, Orissa, Punjab, Peninsula, Northeastern States, Uttar Pradesh, Western India and West Bengal.

Remarks: Hawling recorded at Taluka (2150 m) and Sankri (1850 m); local villagers reported their presence from Satta (2050 m) and Masri (2150 m).

7. Genus: **Vulpes**

8. **Vulpes bengalensis** (Linnaeus); Common Red Fox; Red fox

1758. *Canis vulpes* Linnaeus, *Syst. Nat.* 10th ed. **1**: 40.

Type locality: "Europa", Asia, Africa, Antrafodiens, restricted by Thomas (1911) to Upsala, Sweden.

Distribution: India: Gujarat, Kashmir, Ladakh, Punjab, Sikkim, and Uttar Pradesh Himalaya.

Sightings: Local Villagers reported from Taluka (2100 m)

Status: CITES- Appendix III.

6. Family: **Felidae**

8. Genus: **Felis**

9. **Felis chaus** Schreber; Jungle Cat

1777. *Felis chaus* Schreber, *Die Säugethiera*, 2(13): pl. 110 B (1777); Text, 3(24); 414(1777).

Type locality: Terek river, north of the Caucasus, Dagestan, C.I.S.

Distribution: India: Gujarat, Kashmir, Madhya Pradesh, Sikkim, South of Krishna river, Rajasthan, Uttar Pradesh and West Bengal.

Reports: Reported by the villagers from Satta (2050 m).

Status: CITES-Appendix II.

9. Genus: **Prionailurus**

10. **Prionailurus bengalensis** (Kerr); Leopard Cat

1792. *Felis bengalensis* Kerr, **In. Linnaeus, Anim. Kingdom, 1** : 151.

Type locality: Bengal, India.

Distribution: India: Northwestern, Central, Northeastern States.

Records: Fecal matter seen on Kedarkantha Trek (2550 m) and Istragad (2075 m) area.

Status: CITES-Appendix I; IUCN-Endangered.

10. Genus: **Panthera**

11. **Panthera pardus** (Linnaeus); Leopard; Panther

1758. *Felis pardus* Linnaeus, *Syst. Nat.* 10th ed., 1: 41.

Type locality: India, Thomas (1911:135) fixed as Egypt.

Distribution: India: throughout in suitable

pockets. Remarks: Local villagers reported from Satta (2050 m), Jakhhol (2400 m) and Sankri (1850 m).

Status: CITES-Appendix I; IUCN-Threatened.

11. Genus: **Uncia**

12. **Uncia uncia** (Schreber); Snow Leopard
1775. *Felis uncia* Schreber, *Die Säugethiere*, 2: (14): pl. 100(1775); text, 3 (22):

386-7 (1777).

Type locality: Kopet Dag Mountains, adjacent to Iran.

Distribution: India: Jammu and Kashmir, Himanchal Pradesh, Uttaranchal, Arunachal Pradesh. Sightings: Wildlife guards reported their presence on higher ridges of Kedarkantha and Posla area of the sanctuary

Status: CITES-Appendix I; IUCN-Endangered.

7. Family: **Mustelidae**

12. Genus: **Martes**

13. **Martes flavigula** (Boddaert); Yellow-Throated Marten

1785. *Mustela flavigula* Boddaert, *Elinch. Anim.*, 1 : 88

Type locality: Nepal.

Distribution: India: From Kashmir to North-east India along the foothills of Himalaya, Southern States in suitable pockets.

Sightings: Observed two individuals near Naitwar (1480 m) and one near Jakhhol (2400 m).

Status: CITES-Appendix III; IUCN-Intermediate.

13. Genus: **Mustela**

14. **Mustela altaica** Pallas; Mountain

Weasel; Alpine Weasel

1811. *Mustela altaica* Pallas, *Zoogr. Rosso-Asiat.*, 1. 98.

Type Locality: Altai Mountains.

Distribution: India: Upper Sutlej Valley (1400m), Sikkim. Elsewhere: CIS states, Mongolia, China, Tibet, Korea.

Reports: Reported by the villagers near Jakhol (2400 m).

Status: CITES - Appendix III.

8. Family: **Ursidae**

14. Genus: **Ursus**

15. ***Ursus arctos*** Linnaeus; Brown Bear; Grizzly Bear

1758. *Ursus arctos* Linnaeus, *Syst. Nat.*, 10th ed., 1 : 47.

Type Locality: Northern Sweden.

Distribution: India: Higher reaches of Kashmir, Himachal Pradesh, and Uttaranchal.

Sightings: Villagers reported their presence on higher ridges near Jakhol (2700 m); Sathyakumar (1994) has also reported from the GPV area.

Status: CITES - Appendix I

16. ***Ursus thibetanus*** G. (Baron) Cuvier; Asiatic Black Bear

1823. *Ursus thibetanus* G. (Baron) Cuvier, *Rech. Oss. Foss. Nouv. Ed.*, 4: 325

Type Locality: Sylhet, Assam, India.

Distribution: India: Higher reaches of Jammu & Kashmir, Himachal, Uttaranchal, Darjeeling in West Bengal.

Sightings: 2 cubs were seen as pet near Naitwar, brought from the local forest near Sankri; Sathyakumar(1994) reported the species from the GPV.

Status: CITES - Appendix I; IUCN-Endangered.

V Order: **Artiodactyla**

9. Family: **Suidae**

15. Genus: **Sus**

17. ***Sus scrofa*** Linnaeus; Wild Boar

1758. *Sus scrofa* Linnaeus, *Syst. Nat.* 10th ed., 1: 49.

Type Locality: Germany.

Distribution: India: Throughout.

Sightings: Villagers of Satta (2050 m), Masri (2150 m) and Sankri (1850 m) reported that the wild boar damages their potato crops frequently. It has also been reported from GPV by Sathyakumar (1994).

Status: IUCN- Vulnerable.

10. Family: **Moschidae**

16. Genus: **Moschus**

18. ***Moschus chrysogaster*** Hodgson; Forest Musk Deer; Kastura

1839. *Moschus chrysogaster* Hodgson, *J.Asiat. Soc. Bengal*, 8 : 203.

Type Locality: Nepal (Probably Tibetan Plateau)

Distribution: India: Kashmir, Uttaranchal, Sikkim, Northeast Himalaya.

Reports: Sathyakumar(1994) reported them from GPV; Local villagers say that they are found on upper ridges of Har-ki-dun.

Status: CITES -Appendix I.

11. Family: **Cervidae**

17. Genus: **Cervus**

19. ***Cervus unicolor*** Kerr; Sambar

1792. *Cervus unicolor* Kerr, in Linnaeus, *Anim. Kingd.*, p. 300

Type Locality: Sri Lanka

Distribution: India: Peninsula, Kumaon, North-east States, Northern India, Coromondal, Bengal. *Remarks*: Local

villagers report their from Sankri (1850 m), Taluka (2100 m), Jakhol (2400 m) and Osla (2550 m); Satyakumar, (1994) has also reported Sambar in the GPV area.

18. Genus: **Muntiacus**

20. **Muntiacus muntjak** (Zimmermann); Indian Muntjak; Barking Deer

1780. *Cervus muntjak* Zimmermann, *Geog. Gesch. Mensch. Vierf. Thiere*, **2** : 131.

Type Locality: Java, Indonesia.

Distribution: India: Almost throughout.

Sightings: Widely distributed in Naitwar, Sankri, Masri, Taluka, Satta, Jakhol, between 1450 m to 2400 m altitude. Sathyakumar (1994) reported this species from GPV area.

12. Family: **Bovidae**

19. Genus: **Hemitragus**

21. **Hemitragus jemlahicus** (H. Smith); Himalayan Tahr; Tahr

1826. *Capra jemlahicus* H. Smith, In Griffith et al. [1827]. *Animal Kingdom*, **4** pl. opp. P. 308.

Type Locality: Jemla Hills, Nepal.

Distribution: India: Himalayas from Kashmir through northern India to Sikkim.

Reports: Forest officials and villagers report their availability in the Taluka and Jakhol area. Sathykumar (1994) has also reported the species from GPV.

20. Genus: **Naemorhaedus**

22. **Naemorhaedus goral** (Hardwicke); Goral

1825. *Antelope goral* Hardwicke, *Trans. Linn. Soc. London*, **14**: 518.

Type Locality: Nepal Himalaya.

Distributon: India: Himachal Pradesh, Kashmir, Uttaranchal, Assam, Sikkim.

Sightings: During recent surveys Gorals

were sighted near himri (1550 m), Dhaula (1600 m), and Istragad (2075m) in good numbers. Sathyakumar(1994) has also reported Goral from Istragad area.

Status: CITES-Appendix I.

23. **Nemorhaedus sumatraensis** (Bechstein); Mainland Serow; Serow

1799. *Antelope thar* Bechstein, In Pennant, *Allegemenie, Ueber. Vierfuss. Thiere*, **1**: 98.

Type Locality: Sumatra, Indonesia

Distribution: India: Kashmir, Lahul (Himachal Pradesh), Kumaon, Sikkim, kalimpong (West Bengal).

Reports: Local Villagers reported Serow from Jakhol (2400 m).

Sathyakumar (1994) also reports their presence in GPV area.

Status: CITES - Appendix I; IUCN - Endangered.

21. Genus: **Pseudois**

24. **Pseudois nayaur** (Hodgson); Bharal, Blue Sheep

1833. *Ovis nayaur* Hodgson, *Asiat. Res.*, **18** (2): 135.

Type Locality : Tibetan Frontier, Nepal. (2100 m) and Jakhol (2400m).

Sathyakumar(1994) has also reported Bharal from the GPV area..

Distribution: India: Ladak, Sikkim.

Reports: Villagers reported them from the higher ridges near Taluka.

VI Order: **Lagomorpha**

13. Family: **Leporidae**

22. Genus: **Ochotona**

25. **Ochotona roylei** (Ogilby); Royale's Pika, Large-eared Pika.

1839. *Lagomys roylei* Ogilby, *Royale's Illus. Botany ... Himalaya*, **2** : 69, pl. 4.

Type Locality: Choor Mountain, 96 km north of Saharanpur, India.

Distribution: India: Himalayas in Ladakh, Kashmir, Himachal Pradesh, Uttaranchal.

Reports: Local villagers report their presence near Posla and Kedarkantha area.

23. Genus: *Lepus*

26. *Lepus nigricollis* F. Cuvier; Indian Hare; Black-naped Hare

1823. *Lepus nigricollis* F. Cuvier, *Dict. Sci. Nat.*, **26**: 307.

Type Locality: Malabar, Tamil Nadu, India.

Distribution: India: Throughout.

Sightings: Once it was sighted near Naitwar (1450).

VI Order: **Rodentia**

14. Family: **Sciuridae**

24. Genus: *Petaurista*

27. *Petaurista petaurista* (Pallas); Red Giant Flying Squirrel; Common Giant Flying Squirrel.

1766. *Sciurus petaurista* Palas, *Misc. Zool.*, : 54.

Type Locality: Preanger, Regencies, Java, Indonesia.

Distribution: India: Assam, Bihar, Himachal Pradesh, Kashmir, Maharashtra, Mishmi Hills (Assam) Nagaland, Peninsula, Punjab, Tamil Nadu, Uttaranchal.

Sightings: At dusk it was seen gliding on pine trees near Naitwar (1450).

15. Family: **Muridae**

25. Genus: *Microtus*

28. *Microtus leucurus* (Blyth); Blyth's Vole

1863. *Phaiomys leucurus* Blyth, *J. Asiat. Soc. Bengal*, **32** : 89.

Type Locality: Near lake Chomoriri

(=Tsomoriri), Ladakh, India.

Distribution: India : Himachal Pradesh, Ladakh, Kashmir, Upper Sutlej Valley.

Sightings: Once It was sighted near Istragad(2075).

26. Genus: *Apodemus*

29. *Apodemus wardi* (Wroughton); Field Mouse

1908. *Micromys sylvaticus wardi* Wroughton, *J. Bombay nat. Hist. Soc.*, **18**: 282.

Type Locality: Saspul, Ladakh, India.

Distribution: India: Himachal Pradesh, Kashmir, Uttaranchal.

Sightings: A few individuals were seen near Naitwar (1480m), Sankri (1850m) and Taluka (2100 m).

27: Genus: *Millardia*

30. *Millardia meltada* (Gray); Soft-furred Field Rat; Metad

1837. *Golunda meltada* Gray, *Ann. Mag. Nat. Hist. Ser. 1*, **1** : 586.

Type Locality: Dharwar, Maharashtra, India.

Distribution: India: Bihar, Gujarat, Haryana, Himachal Pradesh Maharashtra, Nilgiri Hills, Peninsula, Punjab, Rajasthan, Tamil Nadu, West Bengal.

Sightings: Once seen at Naitwar (1450 m).

28. Genus: *Mus*

31. *Mus musculus* Linnaeus; House Mouse
1758. *Mus musculus* Linnaeus, *Syst. Nat.* 10th ed., **1** : 62.

Type Locality: Uppsala, Sweden.

Distribution: India: Practically throughout.

Sightings: On many occasions they were seen at Naitwar F.R.H.(1450 m and Sankri area(1850m).

16. Family: **Hystriidae**

29. Genus: *Hystrix*32. *Hystrix indica* Kerr; Indian Crested Porcupine; Short-tailed Porcupine1792. *Hystrix indica* var *indica* Kerr, in Linnaeus *Animal Kingdom*, : 213.*Type Locality*: India.*Distribution*: India: Peninsula, Rajasthan,

Punjab, Haryana, Himachal Pradesh, Kashmir, Uttar Pradesh, Madhya Pradesh, Gujarat, Karnataka, Kerala.

Sightings: On many occasions the quills were seen near Sankri (1850 m), Dhaula (1600m), Istragad (2075 m).

Threatened mammals of GWS & NP

S.No.	Name of Species	CITES	IUCN
1	<i>Vulpes bengalensis</i>	Appendix III	
2	<i>Felis chaus</i>	Appendix II.	
3	<i>Prionailurus bengalensis</i>	Appendix I	Endangered
4	<i>Panthera Pardus</i>	Appendix I	Threatened
5	<i>Uncia uncia</i>	Appendix I	Endangered
6	<i>Martes flavigula</i>	Appendix III	Intermediate
7	<i>Mustela altaica</i>	Appendix III	
8	<i>Ursus arctos</i>	Appendix I	
9	<i>Ursus thibetanus</i>	Appendix I	Endangered
10	<i>Sus scrofa</i>		Vulnerable
11	<i>Moschus chrysogaster</i>	Appendix I.	
12	<i>Nemorhaedus goral</i>	Appendix I	
13	<i>Nemorhaedus sumatraensis</i>	Appendix I	Endangered

DISCUSSION

Present study, which includes direct field observations, published records, as well as the local enquiries made from forest officials and the villagers having knowledge of wild animals, indicates that the Govind Wildlife Sanctuary has similar type of mammalian fauna like other western Himalayan Parks and Sanctuaries (Lamba, 1987; Tak, 1997; Sinha, 1995). Species like *Uncia uncia*, *Ursus thibetanus*, *Ursus arctos*, *Moschus chrysogaster*, *Nemorhaedus sumatraensis* and *pseudois nayaur* inhabits in the higher ridges near snow line, having their bodies covered with dense hairs to protect them from severe cold

conditions, while *Nemorhaedus goral*, *Muntiacus muntjak*, *Cervus unicolor*, *Prionailurus bengalensis* and *Panthera pardus* are found from temperate broad leave forest to mixed coniferous forest and are fully adapted to it. The most commonly seen and wide spread species were the *Nemorhaedus goral*, *Muntiacus muntjak*, *Pseudois nayaur*, *Semnopithecus entellus* and *Macaca mulatta*. However, species like *Uncia uncia*, *Ursus arctos*, *Moschus chrysogaster* and *Nemorhaedus sumatraensis* were encountered on very few occasions, because of non-accessibility of the area-as they inhabit on the higher ranges of the Himalaya, Among the total (32)

reported species, 8 are herbivorous and 11 carnivorous. Out of these 32 species 12 have been placed under Appendix I and II of CITES and 7 IUCN categories. of the 7 IUCN categories, 4 species e.g. *Prionailurus bengalensis*, *Uncia uncia*, *Ursus thibetanus* and *Nemorhaedus sumatraensis* come under Endangered while *Panthera pardus* under Threatened, *Martes flavigula* under Intermediate and *Sus scrofa* under Vulnerable category. This clearly indicates that the area is quite sensitive and important for conservation point of view. Though the area is protected and the Forest and Wildlife departments, Governmental of Uttaraanchal, are taking conservation measures at every step even

than the sanctuary should be protected from degradation and further encroachment by the outer agencies for various purpose. Projects like hydroelectric and widening of roads should be restricted in the sanctuary area for free movement of the animals.

ACKNOWLEDGEMENTS

The authors wish to express their sincere gratitude to Dr. JRB Alfred, Director, Zoological Survey of India, Kolkata for encouragement throughout the investigation. Thanks are also due to Dr. Arun Kumar, Officer-in-Charge, Northern Regional Station, Zoological Survey of India, Dehra Dun for providing various facilities during the course of study.

REFERENCES

- Alfred, J.R.B., Sinha, N.K. and Chakraborty, S. 2002. Checklist of Mammal of India, Rec. Zool. Surv. India, Occ. Paper No. 199: 1-289. (Published - Director, Zoological Survey of India, Kolkata).
- Dang, H.1968. Govind pashu Vihar. A preliminary ecological survey of Har-ki-dun and adjacent valleys, with special reference to Bharal and Red (Brown) Bear. Cheetal, **11** (1): 65-83.
- Fox, J.L., S.P. Sinha, R.S. Chundawat and P.K. Das, 1986. A Survey of Snow Leopard and associated species in the Himalaya of northwestern India. *Project Report, Wildlife Institute of India / U.S. Fish and Wildlife Service / International Snow Leopard Trust, Dehra Dun*, 51 pp.
- Lamba, B.S. 1987. Fauna of Nanda Devi National Park (Mammals and Birds): fauna of Conservation Area: *Zool. Surv. India*, Calcutta. **1**, i-v+1-36, I-XIV pls.
- Sathyakumar, S. 1994. Need for conserving bio-diversity of Govind Wildlife Sanctuary. *WII Newsletter*, 34-36.
- Sinha, N.K. 1995. Mammalia. *Fauna of Western Himalaya, Himalayan Ecosystem Series Part I Uttar Pradesh*. *Zool. Surv. India* 201-214.
- Tak P.C. 1997. Mammalia. *Fauna of Nanda Devi Biosphere, In Fauna of Conservation Area 9 Reserve, A World Heritage Site: Zool. Surv. India Calcutta*. 151-162.
- Wilson, D. E. and Reeder, Dee Ann M. 1992. *Mammal Species of the World; A Taxonomic and Geographic References*. Second edition. Smithsonian Institution Press. Washington and London. Pp. I- XVII + 1-1206.

QUA VAD IS HOMO SAPIENS ?

By : Bulu Imam*

There is little doubt that the denudation of forests and all varieties of big game in Chota Nagpore begn during the British era in the nineteenth century, which also saw the fierce tribal uprisings against this high-handedness with tribal forest lands. Writing in his book CHOTA NAGPORE (First Edn. 1905) John Murray London 1910, 71, 82-83. - a little known province of the Empire by F. B. Bradley-Birt, states about Ranchi district.

“Outside the court room, spread under the trees, is a row of skins, tiger, leopard, bear, wolf, and hyena, proudly guarded by some sportsman from a far-off corner of the district, who has just brought in his yearly bag to obtain the Government reward. He will get twenty-five rupees for each tiger killed, five rupees for a leopard or a wolf, two rupees eight annas for a bear, and two rupees for a hyaena - Sometimes a still larger reward is offered -- as much as two hundred rupees for a man-eating tiger.”

“All the country round here is just the place for bear --- range after range of undulating hills, covered with thick sal jungle. But there is singularly little else to be got. It is not long since leopards and tigers were to be found, but the jungles now seem to have been swept absolutely clear of life -- save for the bear that a careful beat seldom fails to produce.”

“The shooting all over the district is nothing compared with what it once was.

Only a few years ago vast tracts of jungle remained practically untouched, forming natural game preserves well stocked with tiger, leopard, panther and bear. But Chota Nagpore is no longer an unexplored district, and there are few parts that have not been well shot over, while the rewards offered by Government have been an added inducement to the native to exercise all his skill with the bow and arrow or European rifle. Enormous tracts of sal jungle, moreover, have been cut down in recent years, exterminating large quantities of game and driving what remains into the remoter parts of the district.”

“Palamau, until recently a subdivision of Ranchi but now forming a district of its own, has always been one of the best shooting grounds in Chota Nagpore. It is a land of rivers, mountains and jungle and even now in many parts is absolutely undisturbed. But Daltonganj, the headquarters station on the North Koel river, is now the centre of a large coal district, and the introduction of the railway has already made great changes, threatening the peace of the jungle and foreshadowing the inevitable result of the advance of civilization when Palamau too will cease to be a natural preserve and the haunt of big game.”

Perhaps we may agree with the poet who said about Nature,

“Where every aspect pleases

And only man is vile.”

The coming of the railway to Hazaribagh foreshadows the doom of the wildlife such as elephant and the odd tiger which regularly made their way from Chatra to the Hazaribagh National Park. The opening of the North Karanpura Coal mines is slowly but steadily eroding the last forests which are corridors for elephant and tiger in the upper Damodar valley. Anyone who has taken the train from Patratu to McCluskieganj, will have seen the wonderful sheet of sal forest that still clothes hill and dale, reaching a mantle of beauty and ruggedness unsurpassed in the Hazaribagh district at Koel and Hendegir --- and then, as the train rushes into the smog of coal fires around Rai, Churi and the cement factory of Khalari, one is brutally reminded of the fact that coal mining is destroying the last forest wildlife corridors between Hazaribagh in the east and Palamau in the west.

There is no doubt that it was the British hand which destroyed the forest habitat and whose laws were responsible for exterminating the big game of Chota Nagpore. British forest policy restricted the old-grown sal forests to mere poles for harvesting them early an unfortunate practice carried on by the Indian forest department as well. Uptil 1960 tiger permits were being given ad lib without a thought to the fact that tiger was on the brink of extinction. It has today become all too fashionable to blame the sportsmen for destroying wildlife, or blaming the hunting of the Kol, Santal, Ho or Munda. This is very unfortunate because it is not a

perspective based upon the truth.

Huge tracts of forests have but recently been swept away by coal mines in the upper Damodar valley in Hazaribagh and what is now the Chatra district. The air has been so polluted that the great massif of the Satpahar ranges only thirty kilometres to the north of McCluskieganj are no longer visible from that place. There are some nature lovers and sportsmen in these places but they seem to expect it as the inevitable price for development. Which is what brings me to the purpose of this article. Is development going to always remain so destructive of the natural environment and wildlife ? These are the days of wonder-technology, of Bill Gates and futurism. Are we going to allow an old-fashioned, out-dated type of development ruin our last remaining natural resources and watering-spots ?

I have seen the Hazaribagh jungles being preserved by the extremists who hide in them more than the forest department. Ever since these extremists holed up in these jungles --- from Hazaribagh to Palamau -- the jungles have been looking better for their protection. What, are we going to have to rely on extremists to protect our forests now ? These are very sad times. I managed to have the railway being built from Koderma to Hazaribagh through the middle of the Hazaribagh National Park moved some twenty kilometres to the west but it still cuts the park's forests in half and will destroy the elephant and tiger corridors and connectivity with Chatra and Palamau.

Is it necessary that development and so called civilization must inevitably

presage the destruction of age old eco systems and habitats of benchmark biodiversity. Is it necessary that the forests and their wildlife have to be exterminated as the price for civilization and development ? Must we lose the last tree to become civilized ? Must we wipe out old ways of

living and tribes that have lived peacably with their forests and wild game for millenia ? I think Bradley - Birt's observations with which I opened this article are extremely poignant and thought - provoking and challenge us to rethink our predicament in Chota Nagpore --- and the wider canvas of India --- today.

Occurrence of *Bipalium* Smithi (von Graff). Family-Bipalidae. Order-tricladida. Class- Turbelaria. Phylum-Platyhelminthes; Near Udaipur

By
Dr. Raza H. Tehsin*

On 26th Oct 1997 I caught a flatworm near Udaipur from a moist place. the style of locomotion of worm was identical with that of an earthworm, except that it occasionally raised its head from the ground and moved it sideways just like a snake. It also expended its head sideways considerably and its head looked just like a hammer headed shark. During locomotion it crawled leaving behind a slimy trail. I send the specimen to ZSI on 15th of Nov 1997 for identification. Dr. A. Chatterjee, a scientist of ZSI, identified it upto genus. Further correspondence showed they had no facility to identify it to species. ZSI kept the specimen for National Zoological collection numbered W8300/1 with my name as donator.

In the month of October 1998 I caught a few more specimen of the flat worm and sent a specimen to National History Museum, Britain. They identified it as *Bipalium* Smithi (von Groff 1899). Its dimensions are as under:-

Length of the body - 45 mm

Breadth of the body - 6 mm

Breadth of the head lobe - 5.5 mm

Position of the mouth from the anterior end - 22 mm

Position of the genital opening from the anterior end - 29 mm

Free living flat worm (tuebellaria) are rare and least studied worms of the world. In this subcontinent free living flat worms were first collected by M. Sarasin in 1883 from Sri Lanka. Historically the most interesting land planarian collected in India is *B. Smithi* since it is first described from this country with some degree of certainty. The other few mentioned previous to 1914 were all vaguely described and the accounts are practically useless.

Prior to this four specimens were collected from Darjeeling by Lord Carmicheal, Dr. Gravely and Major Bennett. This is the fifth land planaria collected from India.

A few specimens of the flat worms are still with me and those who are interested for further study can contact me.

वन्य-जीवों का संरक्षण

रामेश बेदी*

वन्य-जीवों के संरक्षण के प्रति जागरूकता पैदा करने के लिए बेदी ब्रदर्स (नरेश बेदी और राजेश बेदी) ने वाइल्ड कलेक्शन नाम से शेर, तेंदुआ, हाथी, गेंडा और घड़ियाल के फोटो, छपे मग, टी शर्ट, कलेण्डर, टेबल डायरी, सीज़न कार्ड आम लोगों के लिए प्रस्तुत किए हैं। इनका डिज़ाइनिंग योगेश बेदी (राजेश बेदी के बेटे), अजय बेदी और विजय बेदी (नरेश बेदी के बेटे) ने किया है।

पन्द्रह सितम्बर, 2002 को मौर्य शोर्टन होटल (नई दिल्ली) में इन कलात्मक स्मृति-चिह्नों का लोकार्पण भारत में ब्रिटिश हाई कमिश्नर सर रोब यंग के सी एम जी, उनकी पत्नी लेडी कैथरीन, श्रीमती मेनका गांधी, शास्त्रीय संगीत की गायिका श्रीमती शुभा मुदगल और डाक्टर रामेश बेदी ने किया था।

इस अवसर पर भारत में फ्रांस के राजदूत एच ई सर बर्नार्ड सपत्नीक तथा अन्य अनेक पर्यावरण संरक्षक, पत्रकार, फोटोग्राफर तथा कलाकार मौजूद थे।

भव्य समारोह में लोकार्पण करते समय वन्य-जीवों के प्रतिपालक, प्राणि-मित्र डाक्टर रामेश बेदी ने अपने दिलचस्प अनुभव सुनाए थे :

सात साल की उम्र में मुझे गुरुकुल कांगड़ी युनिवर्सिटी हरिद्वार में अन्तेवासी के रूप में विद्याध्ययन का सौभाग्य मिला था। चारों ओर नदी-नालों का जाल बिछा था। घने जंगलों में गूंजती हुई

शेर की दहाड़ें मेरे कानों में गूंजती थीं। जंगल के राजा का मोहक सौन्दर्य देखने को कुतूहल पैदा होता था।

हर छुट्टी के दिन गुरुजन हमें जंगलों में घुमाने ले जाते थे। जलकुण्डों और नालों में रात को प्यास बुझाने आए जानवरों के पैर के निशानों से गीली धरती पटी होती थी। शेर के पंजों के निशान देखना आम बात थी। निशान गवाह थे कि इलाके का बड़ा शेर भी पानी पीने आया था।

मच्छरों से बचने के लिए कभी-कभी एक शेर रात के सन्नाटे में आश्रम के विस्तृत आंगन में आराम करने बैठ जाता था। अन्धेरे में चमकते हुए दो विशाल गोलक मुझे इस खूबसूरत जीव का ऐहसास कराते थे। उसकी आंखों में कशिश थी, भय नहीं।

कुल पिता स्वामी श्रद्धानन्द जी का बंगला गंगा तट पर एकान्त में था। गंगा के मझाड़े में शेर, तेंदुए, जंगली सूअर रहते थे। एक शिकार पर तेंदुए की दूसरे दावेदार से हुई झड़प में तेंदुआ ज़ख्मी हो गया। वह स्वामी जी के बंगले में शरण लेने आ गया।

शेर के हमले से बचकर एक सांभर आश्रम के परिसर में आ गया था। सारा आश्रम वन्य जीवों का अभयस्थल (wildlife sanctuary) बना हुआ था।

यहां मैं चीतल की डारों में सौ-सौ हिरणों को कुलांचें भरते देखता था। सांभर, पाढ़े, बारासिंगे - हिरणों की कई जातियां यहां मिल जाती थीं।

सांझ का झुटपुटा होते ही हमारे खेल के मैदान में तेंदुए आराम करने आ जाते थे। एक सांझ खेल खत्म करने में देर हो गई। मैदान में तेंदुए के आने का समय हो गया था। वह झाड़ियों के अन्दर छिपा खिलाड़ियों के जाने का इन्तज़ार कर रहा था। खेल खत्म करते हुए एक खिलाड़ी की हिट से गेंद मैदान के बाहर झाड़ियों में चली गई, जहां तेंदुआ बैठा था। जो खिलाड़ी गेंद लेने गया, तेंदुए ने उसकी टांग पकड़ ली। दूसरे खिलाड़ी उसे छुड़ाने गए। उन्होंने हौकियों से पीट-पीटकर तेंदुए को मार डाला।

जंगलों में सभी हाथी आज़ाद विचरते थे। नदियों में लोट लगाते थे। बरसात में उफ़नती नदियों की बाढ़ में हाथी के नन्हें बच्चे बहकर आ जाते थे। एक बच्चे को हमने बाढ़ के पानी में डूबने से बचाया था।

बाढ़ का पानी उतर जाने पर एक मगरमच्छ नदी के सूखे पाट में बोल्डरों में अटक गया था। उसे हमने किसी तरह जलकुंड तक पहुंचाकर उसकी जान बचाई थी।

शिव के अलकों के समान फैली शिवालिक – पहाड़ियों की तलहटी में ऊंचे टीले पर बरगद का एक विशाल पेड़ खड़ा था। उसके विस्तृत वितान के नीचे हाथियों, हिरणों, जंगली सूअरों, शेरों और तेंदुओं के आने-जाने का सिलसिला बना रहता था।

उन्हें गौर से देखने के लिए हमने बरगद के ऊपर मचान बनाया। उसके ऊपर रात को दस जने आराम से सो सकते थे। यहां से हम अपने नीचे वन्य-जीवों के क्रिया-कलाप देखते थे। नाले में या जंगल में उठता हुआ सांभर का भित्ति-संकेत, शेर की दहाड़, हाथी की चिंगघाड़ – जंगल की इस सांकेतिक भाषा को यहां सीखा।

मैं अब भी तराई के उन जंगलों में जाता हूं। हालात बदल गए हैं। जंगल काट डाले हैं। जानवरों को अन्धाधुन्ध मारा जा रहा है। शेर को अपने ही घर से बेघर कर दिया है। पोचर हाथ धोकर उसकी जान लेने को उतारू हैं। शेर की चमकती हुई खूबसूरत आंखें कहीं नज़र नहीं आतीं और, पंजों के निशान भी नहीं। जंगल की गिरती दशा और जानवरों का विनाश देखकर मुझे चिन्ता होती है। दुःख होता है। उन्हें बचाने की कोशिशें की जा रही हैं। क़ानून भी बनाए गए हैं। उनकी अनदेखी की जा रही है। उन्हें सख्ती से लागू करना होगा।

जंगल के इलाके में रहने वाले देहातियों को वन्य जीवों की उपादेयता के बारे में शिक्षित करना होगा। उनकी रक्षा करने में देहातियों का ही भला है।

इस बात को मैं एक दयनीय घटना से स्पष्ट करना चाहूंगा। तराई में अजगर सांप मिल जाते हैं। ये किसानों की फसलों के दुश्मनों – चूहों, खरगोशों, गीदड़ों और मृग छौनों – को खाने फसलों के अन्दर आ जाते हैं। लाल ढांग के बेदी कृषि फ़ार्म में गन्नों ने पूरी लम्बाई प्राप्त कर ली थी। ऐसे गन्ने अपने सहारे खड़े नहीं हो पाते। उन्हें ज़मीन पर लटक जाने से बचाने के लिए बांधने और उनके फालतू पत्तों को छांटने के काम पर चार देहाती दिहाड़ी पर काम कर रहे थे।

एक सुबह फसल के अन्दर घुसने पर उन्होंने एक विशाल अजगर देखा। वह निष्क्रिय पड़ा था। उसका पेट फूला हुआ था। मज़दूरों ने उस पर लाठियों की बौछार करनी शुरू की और मारकर ही दम लिया। उसके पेट में समूचा गीदड़ निकला। देहाती किसान नहीं जानते थे

कि अजगर निर्विष भला सांप है। उसने गीदड़ को निगलकर फसल बचाने का लाभदायक काम किया था।

जंगलों और वन्य जीवों को बचाने की मुहिम में आम आदमी का सहयोग लेना होगा। शेर जंगल और वन्य-जीवों का प्रतीक है। पांच हजार साल पहले महर्षि वेद व्यास ने महसूस किया था :

शेर जंगल की रक्षा करते हैं, और, जंगल शेरों की रक्षा करता है।

शेरों के बिना जंगल जंगल नहीं है, और जंगल के बिना शेर का जीवन व्यर्थ है।

न स्याद् वनमृते व्याघ्रान् व्याघ्रा न स्युर्ऋते वनम्।
वनं हि रक्ष्यते व्याघ्रैर्व्याघ्रान् रक्षति काननम्॥

महाभारत, उद्योगपर्व, प्रजागर पर्व, अध्याय 37

; 46.

Wildlife Preservation Society of India

The aims and objects of the Society are as follows :-

To promote interest and impart knowledge regarding the preservation and conservation of all forms of wildlife, particularly among the youth of the country.

To cooperate with the Govt. of India and State Governments and with others Societies and Institutions having similar aims and objects in working for the interests of wildlife.

To assist in enforcing and actively supporting the Forests Acts. Wild Birds and animals Protections Acts and Rules etc. of State Governments and the Indian Arms Act and Rules in so far as they pertain to wildlife and to bring to the notice of the authorities any infringement of the same and to assist in the detention and prosecution of offenders in respect of such laws.

To advise and help the Govt. and wildlife administrators in the formation, maintenance and protection of Sanctuaries and National Parks, preservation of wildlife in general and endangered species of India in particular and in the introduction of exotic species into the country, rehabilitation of endangered species etc. and in the formulation and amendments of rules and acts, so as to conserve and increase wildlife stocks.

To raise funds for carrying out the above aims and objects and to found and maintain museums reading rooms and libraries of natural history in order to disseminate knowledge regarding wildlife.

To carry out publicity and propaganda for the preservation of wildlife in India by means of monographs, journals, films, filmstrips and other feasible methods.

To assist members of the Society in obtaining facilities for viewing and photographing wildlife in India.

To conduct research into the problem of Wildlife management in India, and in pursuance of this, to initiate, encourage and, where possible assist in the projects for the study of threatened species and related objects and to provide reference and research facilities for such work.

To carry on such other activities which will serve the above subjects.

What membership of Wildlife Preservation Society of India will entitle you to?

You will become an active member of the growing group of Wildlife enthusiasts, who enjoy working for and spreading the knowledge of how to conserve India's heritage of wildlife for posterity.

You will be entitled to the full use of the library of the Wildlife Preservation Society and of its reading room.

You will receive a membership certificate.

You will receive a personal Identification and Membership Card.

You will be entitled to buy all publications of the Society at a concessional rate.

You will be entitled to buy at concessional rates the Societies Greeting Cards, Calendars, Tie, Label badges and the Balance of Nature Game (specially Published in colour for its educative and recreational values).

You will be supplied "Cheetal", the quarterly journal of the society free.

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